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Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

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Fossil Gaps?
Here's a Fossil Gap!

The Margaret Mead Controversy Revisited
Much Ado About Nothing
Freeman, Mead, and Evolution

The Martian Panic 60 Years Later

The Perils of Post-Hockery

May the Force Be With You

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

AT THE CENTER FOR INQUIRY–INTERNATIONAL (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)

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EDITOR'S NOTE

Coming of Age in America

Margaret Mead was not a tall person, but she was a towering presence in anthropology and in American science generally. I fondly remember her dominant countenance in the 1970s at annual meetings of the American Association for the Advancement of Science, of which she was then president. Walking stick firmly in hand, she had a refreshing willingness and ability to talk to the public in plain terms and with wisdom and insight about broad social and cultural trends. Beginning in 1983, Australian anthropologist Derek Freeman has been writing very critically about Mead's early work in Samoa in the 1920s, implying that she was gullibly hoaxed by young female informants and that her work was therefore irretrievably tainted. The media have widely reported his arguments and so too have we, in our pages. Now we present a fresh look at Freeman's charges and arguments. In two related articles, sociologist James E. Côté of the University of Western Ontario and anthropologist Paul Shankman of the University of Colorado make a strong case that Freeman's arguments are deeply flawed and that the media and public have been led astray by them. I think you will find them revealing. (I thank Carla Selby and Béla Scheiber for facilitating these articles.)

* * *

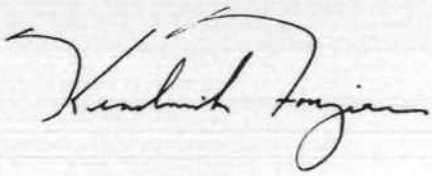
It has been sixty years since Orson Welles's famous Mercury Theater radio presentation of "War of the Worlds." Social psychologist Robert E. Bartholomew (James Cook University) takes us back to that dramatic event and the public reaction to it and shows why the lessons learned from it are just as relevant today. Today's society is far from immune to mass panics and scares, and in fact we have gone through some recent examples.

* * *

Creationists make much of the phrase "fossil gaps." In this issue, David A. Thomas describes how paleoscientists can manage to overcome great difficulties and inadequacies in the fossil record to piece together a coherent picture of an ancient geological era. He takes his case from the dinosaur-rich Morrison formation. Most of it is gone or shielded from our access, but look what it nevertheless has given us! The illustrations on the cover and on page 27 are Thomas's too—photos of his own creations. A serious amateur paleontologist and skilled sculptor, his realistic sculptures of dinosaurs grace a number of natural history museums. If Thomas's name seems familiar, it is. He is the father of SKEPTICAL INQUIRER consulting editor and Bible Code-debunking physicist David E. Thomas. Both are active in New Mexicans for Science and Reason, of which the younger Thomas is current president.

* * *

In "The Perils of Post-Hockery," social psychologist John Ruscio of Brandeis University describes how prone we all are to *post-hoc* (after-the-fact) reasoning that helps confirm our beliefs (to ourselves at least) and shields us from unwelcome views. We all do it, but there are ways to improve our ability to evaluate evidence. And I think you'll have fun taking the simple ten-question test of factual knowledge to evaluate confidence that he provides toward the end his article. I've had many friends take it, and we have all come away surprised.



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Science and Reason, Foibles and Fallacies, and Doomsdays

Heidelberg Conference attracts 300 delegates from 23 countries

KENDRICK FRAZIER

In the twenty-two years since its beginning, the modern skeptical movement has gone from an idea in the minds of philosopher Paul Kurtz and a handful of concerned colleagues to a widely recognized international network of organizations. Ninety-two skeptics organizations in thirty-three countries now examine paranormal claims, explore the boundaries between science and pseudoscience, and consider social, philosophical, and educational issues involving science and the public.

In the 1980s the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP)—which started it all—began holding conferences about every eighteen months in cities and academic settings around the United States. In 1996, CSICOP celebrated its twentieth anniversary with the first World Skeptics Congress at the place of its founding, the State University of New York at Buffalo (SI, September/October, 1996).

The Second World Skeptics Congress, July 23–26, 1998, in the picturesque city of Heidelberg, Germany, was the most cosmopolitan ever. The sessions took place in a modern lecture hall at the ancient and historic University of Heidelberg (founded in 1386). The congress featured three and a half days of sessions, most in English, some in German, with more than 300 registrants from twenty-three countries.

Heidelberg, site of the Second World Skeptics Congress.

It was sponsored by CSICOP and co-sponsored by the European Council of Skeptical Organizations and the German skeptical organization GWUP *(Gesellschaft zur wissenshaftlichen Untersuchung von Parawissenshaften).*

With the dawn of new millennium looming, the conference theme, "Armageddon and the Prophets of Doomsday" served as a convenient springboard to a wide range of topics in and out of science. Millennium prophecies, natural disasters, and environmental concerns were at the core, but there was ample time to consider antiscience and the postmodernists, alternative medicine, the problems of memory, the paranormal and skepticism in China. And there were some case studies—reports of investigations into such matters as dowsing, the Shroud of Turin, and "bio-energetic products." There was also a workshop for skeptics.

And—as is not always the case at these session-packed conferences—there was some time for socializing. The traditional conference banquet was replaced by an informal evening on a double-deck boat sailing up the river Neckar, culminating in illuminations of high-perched castles and a magnificent fireworks show, the sounds echoing off the canyon walls.

Paul Kurtz

"As we approach the year 2000 we are surrounded by prophets of doom who predict that terrible disasters await us," said CSICOP Chairman Paul Kurtz in opening the congress. We have a natural yearning to know the future and a certain mixture of optimism and apprehension about it. The trick, he emphasized, is to apply the methods of scientific inquiry in examining all claims, including those about doomsdays and disasters, whether concerns arise from secular, religious or New Age origins.

If you think these science-minded skeptics would therefore automatically pour cold water over every expectation of disaster, you'd be wrong. The threat of catastrophic comet and asteroid impacts onto Earth was deemed real, global warming was taken seriously, sudden climate flip-flops were seen as a strong possibility, and the Year 2000 problem with the world's computers was far from dismissed. ("Will the worst happen?" asked science and technology writer Wendy Grossman, author of the recent book *net.wars*. "Who knows? The most informed technical minds believe that the chances are that at least some things will fail.")

Alan Hale

There was lots of real science. Astronomer Alan Hale, co-discoverer of Comet Hale-Bopp, the largest and most dramatic comet in decades, discussed the scientific significance and popular lore of comets and gave a personal account of his discovery.

He then lambasted the combination of scientific illiteracy, willful delusions, a radio talk-show's deceptions about an imaginary spaceship supposedly accompanying the comet, and a cult's bizarre yearnings for ascending to another level of existence that led to the Heaven's Gate mass suicides.

Hale says that well before Heaven's Gate, he had told a colleague, "'We are probably going to have some suicides as a result of this comet.' The sad part is that I really was not surprised."

"Comets are lovely objects," he said, "but they don't have apocalyptic significance. We must use our minds, our reason."

Fellow New Mexico scientist David E. Thomas gave an entertaining talk about his debunking of the "Bible Code" (SI, November/December, 1997). Using the same "equidistant-letter sequence" methods that author Michael Drosnin used in computer-searching the text of the Hebrew Torah, Thomas showed how he could find similar "messages" in other literary works.

Drosnin had claimed that using his methods, the words "Nazi" and "Hitler" appear linked in the Torah but not in Tolstoy's novel *War and Peace*. Thomas found both in *War and Peace*. "I won't call Drosnin a liar," said Thomas, "but here is a claim he made that is demonstrably false."

Using Drosnin's methods Thomas also found that the King James version of Genesis contained such phrases as "The Code Is Bogus" and "Darwin Got It Right." Applying them to Drosnin's own book, *The Bible Code*, Thomas found "The Code is Evil."

Amardeo Sarma, convenor of the German skeptical organization GWUP and a member of the CSICOP Executive Council, was honored by CSICOP at the end of the Second World Skeptics Congress with a "Special Citation for Distinguished Contributions to the Skeptical Movement." Sarma was recognized by the Executive Council for his "outstanding dedication and effectiveness in furthering the cause of science, reason, and skepticism in Germany and worldwide."

Giving import to such post-hoc data-mining procedures, Thomas noted wryly, is a double-edge sword. Thomas says he even found in *War and Peace* a "prediction" that Michael Jordan and the Chicago Bulls would win the 1998 National Basketball Association title. (They did; see News and Comment, this issue.)

"Either Tolstoy is the Supreme Creator of the Universe—or perhaps the Bible Code is just an arcane mathematical technique that allows one to harvest detailed hidden messages from any text."

Keynote speaker Elizabeth Loftus, the University of Washington psychologist and expert on the malleability of memory, described a litany of new studies that show, in her words, "the power of imagination to make people believe that they have had experiences that they didn't have." As she summarized: "People have been led to remember nonexistent events from two weeks ago, from their childhood, and even from the day after they were born. These findings fill in our understanding of the rather flimsy curtain that separates imagination and memory."

Numerous other foibles, fallacies, falsehoods, and examples of false science were revealed and targeted in a variety of presentations.

In Europe, homeopathy has wide popular and political support, said Willem Betz, professor of medicine at Brussels University and a national delegate to a program in which fifteen European countries collaborate to set rules for recognition of alternative medicine. Proponents of homeopathic medicine "know quite well" that it "would be quite impossible to meet the criteria, so they offer countless arguments why the strict rules should not apply to homeopathy."

He also gave an example of typical "homeopathic logic": Its proponents contend both that "proof is not possible" and that "proof is piling up." Said Betz: "Never give an aura of science to nonsense."

Prominent Dutch astrophysicist Cornelis de Jager, a former president of the International Council of Scientific Unions, one-time general secretary of the International Astronomical Union, and current chairman of the European Council of Skeptical Organizations, used well-tuned humor to take on the absurdities of those who attach great mystical significance to measurements of the Great Pyramid. He had the audience in stitches with his deadpan talk about the "meaningful" measurements he took in the corridors of his home. His home is in an astronomical observatory, a location, he said, "that may be very close to the cosmos and well receptive to its incredible powers."

Jean-Paul Krivine of the French Union Rationaliste described New Age and pseudoscientific practices used in French companies. Many companies in

Anti-science Postmodernists
Rhetoric Over Evidence

One of the liveliest sessions at the Second World Skeptics Congress was "Anti-Science and Postmodernists," and Jean Bricmont was its central figure. Bricmont, professor of physics at the University of Louvain, Belgium, is co-author with Alan Sokal of *Intellectual Impostures.* Sokal is the American physicist whose hoax paper satirizing the rhetorical excesses and scientific pretensions of extreme postmodern criticisms of science was published in the journal *Social Text* in 1996 without its editors realizing the article was a parody (see "Physicist Alan Sokal's Hilarious Hoax," SI, November/December 1996).

Last year Sokal and Bricmont expanded on their argument in their book. Published in Paris, it raised a storm of controversy, because many (but not all) of the philosophers and social critics who are the subject of its criticisms are French. And the French take their intellectuals very seriously. ("Americans don't have famous intellectuals as the French have," he said; the crowd moaned in reluctant agreement.) The book was published in English for the first time this summer in London (see page 58), and an American edition is due out soon.

Bricmont says Sokal's 1996 article was like a Trojan horse brought within the walls of cultural studies and science studies. "His article was full of nonsense."

Bricmont said criticism of science is healthy but too many of these "science studies" critics write without truly understanding science. They use scientific words and concepts they don't understand. "The editors did not understand Sokal's article," he said. "If they did understand it, they would have known it was bullshit. So how could their readers have understood? What were their readers to learn?"

Bricmont showed the audience excerpts from some of the postmodernist writings on science, calling one example "a maximum amount of confusion in a minimum number of words."

He said these critics insist they are not antiscientific and argue, "We are scientists just like you." Yet they profess that scientific theories are little different from socially constructed viewpoints, opinions no better than any others.

Yet, said Bricmont, it doesn't work to try to understand theories and make judgments on whether belief in them is rational or irrational "without regard to whether they're true or false."

"That doesn't work," he said. "You can't explain why people come to believe in anything without discussing the evidence for it. To explain the cause of belief, you have to consider maybe it is because it is true or rational, that evidence supports it. Without looking at the evidence, there is no way to understand" why scientists support one theory over another. "If you look at it purely sociologically, you don't always see."

The panel on anti-science and postmodernism concluded with a lively question session discussing all these issues. One audience member cautioned that this debate is not just academic. She told of similar antiscientific rhetoric that her daughter was forced to study in her classroom. "I am concerned about the damage being done to the average student."

Astrophysicist Evry Schatzman, a former president of the French Physical Association, was a member of the panel. In the discussion, he pointed out that in astronomy new astronomical instruments regularly come into operation, and they "make new discoveries almost every day." He echoed many scientists' antipathy toward the postmodernists' rhetoric and criticisms. "These philosophical speculations are so much away from the way we [astronomers] work, that we are not interested in them."

— *K.F.*

France are widely using nonrational and nonscientific methods such as graphology and numerology. Graphology, he said, is used by most recruiting departments in France.

In recent years the popular press has made frequent references to experiments conducted by a university group from Munich (H. Wagner, H.-D. Betz, and others) that professed to find a core of skilled individuals who supposedly have unexplained success in dowsing. These so-called "Scheunen experiments" have been funded by the German government. They have given the impression that physicists have shown that dowsing is a real phenomenon.

J.T. Enright of the Scripps Institution of Oceanography reported on a thorough reexamination he has carried out of the experimental results. The results, he said, show the exact opposite of what the proponents are claiming. Showing a plot of the scattered data on a chart in which the dowsing proponents claim to see trends supporting dowsing abilities, Enright said: "It is hard to imagine a set of data that represents a more convincing disproof of dowsing. I challenge anyone here to show any difference between randomly generated data and the actual data."

Lest anyone think he or she is immune to the self-deception that goes into forming and holding to paranormal unsupported beliefs of every sort, psychologists Ray Hyman (University of Oregon) and James Alcock (York University) would relieve you of that misperception. In their world congress workshop on critical thinking, they emphasized how hard it is for us to see through our own preconceptions.

"Teaching people to think critically in their individual lives is hard," said Alcock. "The world is more likely to give information that confirms our beliefs than not, because of the way we interpret information.

"So if we believe in something, people's experiences will confirm it.

"All of us—myself included—hold beliefs that are false. I'm sure I do. The problem is I don't know which ones."

"Unless we try to use a logical, scientific approach, we will just compound the errors our brains make."

Kendrick Frazier is Editor of the SKEPTICAL INQUIRER.

Alternative Medicine, Impact Threats, Abrupt Climate Change, and Efficient Energy

MATT NISBET

23 Countries at World Congress

These were the countries represented at the World Skeptics Congress in Heidelberg:

Austria	**Ireland**
Australia	**Italy**
Belgium	**Japan**
Bulgaria	**Netherlands**
Brazil	**Norway**
Canada	**Russia**
China	**Slovak Republic**
Czech Republic	**Spain**
Finland	**Switzerland**
France	**United Kingdom**
Germany	**United States**
Hungary	

World Skeptics Congress Convenes with Participants from Five Continents

Here is a brief review of several of the sessions at the World Skeptics Congress. More reports will appear in future issues.

At Heidelberg University, on the bank of the Neckar River, some 300 skeptics, scientists, experts, and academics from North America, Europe, Australia, Asia, and South America convened to discuss and critically evaluate the latest claims of the paranormal and pseudoscience and consider some crucial issues in real science.

Opening the World Skeptics Congress, Paul Kurtz, professor emeritus of philosophy at the State University of New York at Buffalo and founding chairman of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), declared: "Skeptics want to focus on inquiry, not doubt. We simply insist that there be sufficient evidence, rational coherence, or replicable experimental confirmation of claims and that hypotheses introduced undergo rigorous peer review and corroboration before they are accepted."

Leading medical researchers' comments on the perceived growth of alternative medicine in North America and Europe highlighted half-day plenary sessions on topics that included millennial doomsday predictions and a workshop on critical thinking.

Alternative Medicine Studies Flawed, Politicized

North American and European medical experts emphasized a serious problem: the public is not getting scientifically valid information on alternative therapies. From poor or biased experimental design to "absolute fakery," Wallace Sampson, M.D., clinical professor of medicine at Stanford University and editor of the *Scientific Review of Alternative Medicine,* outlined reasons why many studies allegedly proving alternative therapies are flawed. "The best-quality papers and studies on such popular alternative therapies as homeopathy and acupuncture show little effectiveness, while the worst-quality papers and studies show the most effects."

Sampson pointed out that promoters of alternative medicine and the media often misquote and misreport the findings of the latest studies. As examples, Sampson said that, contrary to popular claims, alternative therapy has *not* increased in popularity over the last two decades. He refuted the notion that many alternative therapies are more cost-effective than proven scientific treatments. He pointed to insurance-industry studies that show chiropractic care—often cited as the "most effective treatment for back pain"—is the second-most expensive category of care provider, next to neurosurgery.

Willem Betz, professor of medicine at the Free University of Brussels, Belgium, echoed Sampson's comments when he discussed the state of alternative medicine in Europe. Betz, a member of the European Committee of Science and Technology, said the evaluation of alternative medicine on the continent "is not science, but politics." The alternative medicine industry uses biased polling results to push alternative medicine acceptance. "Their figures are suspect in promoting alternative therapies, but their math is conventional when billing their patients." Betz described the alternative medicine industry as now actively focusing on Eastern European markets.

Psychologist Barry Beyerstein (of Simon Fraser University) reviewed the reasons people believe in bogus therapies. Beyerstein says that alternative medicine's enduring popularity stems from widespread public scientific illiteracy, aggressive alternative medicine-industry marketing, New Age faddishness, inadequate media criticism, a growing distrust of authority that includes the scientific and medical establishment, and an anti-doctor backlash. "Natural is considered safe. Though I like to remind people that tobacco is a naturally occurring substance," Beyerstein told the audience.

Ways in which purveyors of alternative therapies fool themselves include the human will to believe, the ubiquitous placebo effect, erroneous equations of correlation with causation, overemphasis of anecdotal evidence, naturally occurring self-healing, misdiagnosis, and the *post hoc* fallacy of automatically assuming that treatments or nostrums triggered subsequent recovery. "Many of these are confounding effects, examples of the classic 'disease of the week' misdiagnosis, and the failings of human logic."

The medical experts emphasized that the evaluation and eventual acceptance of alternative therapies necessitate adequate sample size, random assignment of patients, placebo-controlled trials, proper statistical treatment of data, long-term follow-up, and multiple replication of studies.

Astronomer Says Cosmic Impact Threat Likely

The recent Hollywood films *Deep Impact* and *Armageddon* have highlighted the threat from cosmic collisions, but the findings of science emphasize the need for increased funding for identifying near-Earth objects (NEOs), said James McGaha, retired USAF Major and director of the Grasslands Observatory of Arizona. "The threat from cosmic impact is real and hazardously dismissed by the public and decision-makers," said McGaha.

Some 300 identified NEOs may be on potential collision paths with Earth, but there are an estimated 9,000 unknown NEOs of 0.5 km or greater in size. The warning time before collision of a previously unknown NEO would be less than eighty days for a comet and less than thirty days for an asteroid. The impact of a 2 km NEO with Earth would result in catastrophic earthquakes, tsunamis, sun-blocking clouds of dust and ash, drastic drops in temperature, global crop failure, and widespread starvation. More than 25 percent of Earth's human population would perish.

McGaha said further funding and research needs to be devoted to locating NEOs and developing/testing means of diversion. Currently the U.S. government devotes just $1.5 million to NEO research, with NASA recently approving a marginal increase to $3 million for next year. Testing diversion methods is of special importance, noted McGaha. Once a NEO is within a close enough range to Earth, no diversion method will save lives.

David Morrison, CSICOP Fellow and director of space at NASA Ames Research Center, is part of a team of scientists lobbying Congress for funding for a much-needed "Space Guard" project that would fund six telescopes around the globe to search for and find all NEOs. (For more on the NEO threat, visit the Web site http://impact.arc.nasa.gov/.)

McGaha said the threat from NEOs and sparse budgeting for science make a recent report by the Society for Scientific Exploration advocating government support for UFO research (SI, September/October) appear ridiculous. "Why fund mystery-mongering about UFOs when NEOs are real threats in our skies that go almost totally unheeded?" he asked.

continued on page 12

Fund for the Future

CSICOP AT THE CENTER FOR INQUIRY

1·9·9·8 PRIORITY

Using the Media & Telecommunications to Promote Science and Reason

The Fund for the Future is a capital campaign to provide CSICOP the resources needed to more effectively influence media and public opinion. The 90s have been defined by a telecommunications revolution, along with an explosion of misinformation available to the scholar and citizen alike. The hunger for superstition, pseudoscience, the paranormal and miraculous solutions has never been more acute.

The Ten-Year Plan

1998 Contributions are needed for current priorities:

- Increased media appearances by skeptical spokespersons
- Press releases, opinion pieces and media alerts
- Greater exposure through the Internet, including webcasting
- National initiatives coordinated by the Council for Media Integrity
- Instructional materials introducing skepticism to elementary and secondary school students
- Video production

Newsflash: This November CSICOP will convene a conference in Southern California to publicize many of these initiatives

Council for Media Integrity

Formed just weeks after its inclusion in the Ten-Year Plan, the Council for Media Integrity will monitor and rebut media programs that convey unfounded claims and mislead the public about science. Members include Steve Allen (chair), Stephen Jay Gould, and many others. CSICOP will invest in electronic infrastructure to facilitate rapid response to irresponsible programs.

Enhanced Library Resources

The Center for Inquiry's skeptics' library—already the finest of its kind in the world—needs expanded funding to enlarge its core collection and add electronic media. Worldwide modem access to the library's catalog is already nearly complete.

Adult Education

The Council cosponsors the Center for Inquiry Institute, which has already expanded its offerings to include a new three-year certificate program in science and skepticism. Sessions are scheduled in Amherst and Los Angeles.

How Can You Help?

CSICOP has established its expertise and integrity. It's time to command more media attention and a larger audience. The Center for Inquiry Fund for the Future is about new methods of outreach and broader influence, and is driven by an ambitious ten-year strategic plan for growth.

We depend on the support of readers and friends to continue leading the international skeptical movement. Gifts to the Fund for the Future provide the resources we need to respond to today's challenges.

All gifts are gratefully accepted. The Fund for the Future welcomes gifts of encouragement and major investments.

Cash contributions and gifts of stock are needed for immediate growth and new initiatives. We also offer a range of planned giving opportunities, from bequests to assorted tax-advantages trusts and pooled funds. Planned gifts support our work in the future and can provide an income stream for you and a beneficiary. You may also make a gift supporting the general endowment, or establish a special purpose fund underwriting a long-term project which expresses your personal interests and commitment to skepticism.

In today's stock market, gifts of highly appreciated securities offer particular advantages to the donor. When donating stock to a charitable organization, you avoid taxes and maximize the impact of the asset you are donating.

Contact Anthony Battaglia
at (716) 636-7571 ext. 311
or via e-mail at CFIANTHONY@AOL.COM
to discuss accomplishing your
philanthropic and financial goals

CSICOP
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Martin Gardner
Honorary Co-chair

Steve Allen
Honorary Co-chair

Regional Outreach

With the establishment of The Center for Inquiry–West (Los Angeles), The Center for Inquiry–Midwest (Kansas City) and The Center for Inquiry–Rockies (Boulder, Colorado), giant steps have been taken to enhance direct field service to skeptical activists. Additional regional Centers are planned with expanded calendars of activities.

Priority For the Young

To present the skeptical message more compellingly to the young, CSICOP will develop new materials—ranging from age-appropriate print publications to audio and video cassettes and instructional coursework. Goals include enhanced understanding of science and improved critical thinking skills.

Experts Review Global Climate Threats, Energy-Saving Solutions

In Friday afternoon presentations, two experts, one from academia, the other from business, forecast possible futures for Earth's climate. William Calvin, a neurophysiologist at the University of Washington, outlined the potential threat of what he calls the "The Great Climate Flip-Flop," an abrupt cooling of Earth that could result in widespread crop failure, significant landscape change, and genocidal battles among nations for food resources.

"No serious scientist wants to be seen as a prophet of doom, but this is not a prediction, this is history" said Calvin, referring to past climate flip-flops in Earth's history. Calvin first became interested in the topic through studying climate's influence on human brain development.

The most dangerous result of global warming could be the triggering of a modern ice age, says Calvin. Contrary to popular belief, global temperature change can be fairly quick and drastic. Earth could be due for another plummet in temperature, a change that could be sparked by the effect of global warming on currents that form a "heat engine" for the north Atlantic.

Much of the warming effect of northern latitudes, including Europe, is created by a powerful North Atlantic current that flows from the tropics to Greenland. The current endows Europe, a continent that shares the same latitude with Canada, with a temperate enough climate to support a population of 650 million.

Drawing on research by Columbia University geochemist Wallace Broecker, Calvin described the North Atlantic current as a conveyer belt, delivering warm surface water to northern regions. Salt-heavy, the current reaches northern latitudes near Greenland, sinks, and travels south to be recycled in waters as far away as the Pacific.

A greenhouse-generated warming effect can cause cooling by dumping large amounts of fresh water into the ocean, and interrupting the conveyer belt flow of water in the North Atlantic. Under greenhouse warming conditions, large amounts of fresh water enter the ocean through increased high-latitude rainfall and melting ice. Shifts in the ice flow can also cause blockages in fjords and other waterways, resulting in the buildup and then sudden release of millions of gallons of freshwater into the Atlantic.

"We cannot avoid trouble by simply cutting down on our current contribution to the greenhouse warming trend. We need to identify the important feedback effects that control climate and ocean currents," warned Calvin. Possible global cooling prevention strategies include opening channels through fjord ice dams, seeding clouds to deliver rain away from North Atlantic areas of sinking water, regulating the Mediterranean Sea's salty outflow, and digging a wide sea-level Panama Canal.

Why has discussion of the Climate Flip-flop scenario not received greater attention in the media? Calvin was asked. He observed wryly that "Hollywood catastrophe movies co-opt the marketplace for discussion of possible futures."

* * *

A top advisor to President Clinton on energy policy and global warming, Thomas R. Casten, president and CEO of New York-based Trigen Energy Corporation, outlined his outlook on defeating the greenhouse gas problem through improved energy efficiency. Citing as evidence a correlation between increases in world population and increases in CO_2 gas and water vapor, Casten declared that "there is a greenhouse gas problem. I think humankind is rolling some very big dice, and the question is what do we do?"

Casten is a member of the CSICOP Board of Directors and Executive Council.

The U.S. contribution to CO_2 gas emission equals 25 percent of the world total, and Casten noted that U.S. waste in power generation exceeds Japan's total fuel use. "There is market failure across the world. Power generation is drastically inefficient. The best environmental strategy ever devised is efficiency: Don't burn the fuel."

Current U.S. energy efficiency is at 33 percent, with the country reaching peak energy efficiency in 1959. In comparison, Denmark operates at 50 percent efficiency. "It is an appalling record when you look at advances in computing, jet planes, and other technologies."

Casten pointed to government protection of utility monopolies as causing disincentives to improved energy use and production. "We've protected our companies from competitiveness, and you get what you reward. If you don't reward the energy industry, you won't get efficiency." Casten said that new energy regulations should emphasize input versus performance standards in efficiency and pollution. Government efforts also have to target phasing-out and cleaning up decades-old power plants. Many of the older plants have grandfathered-in emissions compliance, allowing them to be more than 100 times more polluting than new facilities.

To reduce costs, Casten recommended that barriers to competition be eliminated. But since increasing competition will not induce companies to seek optimal environmental solutions, regulations need to guide power companies with efficiency standards. Finally, Casten suggested that megawatt hours of electricity have to be less and less dependent on fossil fuels.

Trigen Energy uses trigeneration of electricity, steam, and cooled water to build power plants that are 91 percent efficient, Casten said. The company, serving more than 1,500 customers at 22 locations in North America, provides heating, cooling, and electricity with one half the fossil fuel and one half the pollution of conventional generation.

Matt Nisbet is CSICOP's Public Relations Director. □

U.K. Broadcast Commission Rejects Geller's *Secrets of the Psychics* Complaint

Did you see that television program last summer with Victorian mediums faking ectoplasm and magicians showing how they could duplicate the kind of psychic feats that Uri Geller is known for? If not, you missed a treat, but not to worry, for now you may be able to see *Secrets of the Psychics* again. And why? Because Geller has had his complaint against the program rejected.

After the program aired in the U.K., Geller complained of unfair treatment to the Broadcasting Standards Commission, and I, along with a team from Channel 4, went to give evidence. It's been a long wait, but the commission has just announced its complete rejection of Geller's complaint (see text of decision, page 14). So it wasn't unfair to have magicians showing how they duplicate those "psychic feats," and experts saying there is no reliable scientific evidence for his psychic powers whatsoever.

If I'm sounding jubilant about this little victory it is not because I personally have anything against Geller. He has always been charming and kind to me, invited me and my children to tea at his flashy mansion on the bank of the Thames, showed us his boat (aptly named "Paranormal"), and let us swim in his pool. No—it is because this is a matter of scientific truth and freedom.

Although millions of people believe in extrasensory perception, ghosts, UFOs, crystal powers and the tenets of astrology, the evidence for ESP is controversial (at best) and the claims of astrology demonstrably false. However, people don't want to see endless meticulous experiments with nothing but negative results. Viewers, and the producers who are their slaves, seem to prefer conspiracy theories, beings from outer space, scientists who cover up the truth about our mental powers, and Russians who can move trains with their teeth or bamboozle television presenters with children's party tricks.

There was a classic, if mild, example of this genre last week. In *The Secrets of Sleep,* we saw an experiment from the 1970s in which U.S. psychologist Charlie Tart tested a young woman who had out-of-body experiences during sleep. We were not told that the woman was a mental patient who disappeared right after the tests and could not be retested, nor that the EEG record showed possible mains interference at the time of her success, nor that another claimant was tested by Tart and failed. The impression given was that this wonderful experiment has been ignored for decades by closed-minded scientists who want to suppress the truth about the psychic powers of our sleeping minds. This is ridiculous. The truth (and how that word is abused when psychic issues are at stake!) is that many other scientists tried to repeat Tart's finding and failed. I was one of them. Why should we scientists ignore such a potentially exciting discovery? If I had succeeded in repeating it I might have uncovered something absolutely new and shocking about reality. But it just isn't so. As Richard Dawkins said, if Geller's powers could be proved to be real they would open up a new field of physics, scientists would flock to be involved, and someone would get a Nobel prize. But they haven't been.

That's why it is so refreshing to see *Secrets of the Psychics*—to see the "mysterious" Ouija board explained, to see the mediums' tricks exposed, and to learn why all those experts doubt that psychic phenomena exist at all. And to all those producers pandering to popular belief, I say: Wake up! It is possible to make an enjoyable anti-paranormal program. It is possible to be skeptical and still please the viewers. Even my local grocer liked it. "You know," she said (lowering her voice) "I don't think Uri Geller's really psychic, do you?"

No, I do not. I was glad to give evidence at the hearing. I was glad to explain why the evidence is not good enough. And above all I was glad that Geller lost his complaint. I may be wrong about his psychic powers, in which case he will be able to prove it to me, and then I will gladly change my mind. Meanwhile, it's good to know that programmers can make challenging and skeptical programs in the knowledge that, if they do so fairly and honestly, the broadcast complaints procedure will stand by them.

And if *Secrets of the Psychics* comes on in America—do watch.

—*Susan Blackmore*

Susan Blackmore is a senior lecturer in psychology at the University of the West of England. She wrote this piece originally for The Independent *(U.K.).*

Myth and Mystery in Southern Climes

As the world shrinks and modern technology advances, the lands to the south continue to intrigue generations of Americans. With their vast, remote regions and rich cultural history, Mexico and Latin America naturally evoke mystery.

It is, however, a short step from the lure of genuine enigmas to the plagues of mystery mongering, conspiracy theorizing, and outright hoaxing—plagues that have often victimized the truth behind the legacies of these tropical civilizations. Here are several examples from the files—the "ex-files"—of SKEPTICAL INQUIRER magazine.

Ancient Effigies

Certain masterworks of native populations have been both deservedly celebrated and greatly misrepresented. These include the massive stone heads that stare vaguely skyward from Easter Island, and Peru's Nazca drawings, figures of birds and other creatures so large they can only be properly viewed from an airplane—or a spaceship. To Erich von Däniken, author of the 1970s bestseller *Chariots of the Gods,* these are evidence of visits by

Broadcasting Standards Commission Adjudication on Geller Complaint

The following is the text of the key introductory and concluding sections of the U.K. Broadcasting Standards Commission judgment regarding a complaint by Uri Geller of unfair treatment in a British science documentary television program, "Secrets of the Psychics" (see adjacent News & Comment article by Susan Blackmore).

Broadcasting Standards Commission

Complaint about unjust or unfair treatment by Mr. Uri Geller submitted on 31 October 1997 about Equinox: *Secrets of the Psychics* on Channel 4 broadcast on 24 August 1997.

Adjudication

1. Introduction

On 24 August 1997, Channel 4 broadcast a programme in its science documentary series Equinox entitled *Secrets of the Psychics*. The programme set out to investigate whether there was any scientific basis for the claims of paranormal and supernatural powers by spiritualists and psychics.

The programme questioned whether the psychic powers claimed by Mr. Uri Geller were genuine. Mr. Geller complained to the Broadcasting Standards Commission that he had been treated unjustly or unfairly in the programme.

2. The Complaint

Mr. Geller complained that:

a) several contributors to the programme had been wrongly put forward as being unbiased and the programme had used unrepresentative extracts from interviews;

b) no positive views had been put forward of Mr. Geller's work;

c) doubt had been cast on the value of scientific testing of Mr. Geller;

d) the programme had used selective and distorted extracts from previous programmes featuring him; and

e) the voice-over in the programme had been generally derogatory.

3. Evidence considered by the Commission

The Commission had before it a complaint from Mr. Geller, with supporting documents, a written statement from Channel 4 also with supporting documents, the complainant's written comments and a response to those comments by Channel 4. The Commission viewed a recording of the programme as broadcast and read a transcript. It also viewed recordings of the extracts from Noel's House Party and the Andrew Neil Show. The Commission held a hearing attended by Mr. Geller and his representatives and representatives of Channel 4, accompanied by Mr. [Sebastian] Cody [executive producer of the show] and Mr. [David] Britland [the show's producer] of Open Media and Dr. [Susan] Blackmore [a contributor to the show]. . . .

4. The Commission's Finding

The Commission accepts that it is part of the role of a flagship science programme such as Equinox to question claims, such as those made by Mr. Geller, from a scientific point of view. It notes that the programme was not entirely devoted to Mr. Geller, but also looked at the history of the paranormal and included a number of other people who claimed to have psychic powers.

The programme made it clear that the contributors featured were sceptical and had not conducted first hand scientific tests on Mr. Geller's claims themselves. The Commission considers that the sceptical approach adopted by the contributors complained of did not prevent them from examining the evidence impartially. Nor does it consider that either they or the programme-makers, whose approach to the subject was consistent throughout the programme, were personally prejudiced against Mr. Geller. The Commission does not consider that the use made of Mr. [Russell] Targ's interview about his testing of Mr. Geller was unfair to Mr. Geller.

While the Commission considers that it is important for a scientific programme to seek balancing arguments, it accepts that Open Media did its best to find scientists who were prepared to support Mr. Geller's position and who met the criteria required by the programme-makers but were unable to do so.

The Commission also accepts that it was appropriate to include contributions from others knowledgeable about the subject. It notes that Mr. Geller said he could have suggested names but, because he had decided not to cooperate, did not do so. In the circumstances the Commission considers that the programme gave a fair reflection of the weight of opinion of Mr. Geller's claims.

The Commission notes that both the criticisms and the partial success of the SRI [Stanford Research Institute] tests were considered in the programme. It finds that legitimate questions were raised about the SRI testing and on the availability of other tests which fell within the programme's criteria. The Commission does not consider that the full extract from the edition of Noel's House Party which was used in the programme made it clear that Mr. Geller was not using the "peek." Nor does it consider that the Equinox voice-over obliterated any significant dialogue in the extract from the Andrew Neil Show.

While there was an element of scepticism in the voice-over throughout the programme, the Commission considers that the programme was clearly signalled as sceptical and in its view the commentary was straightforward.

It does not find that it was unfair to Mr. Geller. Although the Commission does not consider that a scientific programme would necessarily be expected to look at the lifestyle of its subject, it finds that in view of Mr. Geller's success it was reasonable in the circumstances for Channel 4 to refer to Mr. Geller's lifestyle.

The Commission does not, therefore, find that the programme was unfair to Mr. Geller.

Accordingly, the complaint is not upheld.

17 June 1998

Joe Nickell's condor drawn on a Kentucky landfill site using methods and materials available to the Nazca Indians.

"ancient astronauts." Supposedly it was their advanced technology that helped the "primitive" natives produce the effigies, possibly as landing beacons or as offerings to the extraterrestrial "gods."

In fact, Easter Island's quarries contain unfinished, abandoned statues (believed to honor ancestral rulers) that provide mute testimony of their stone-ax creation. In 1955 explorer Thor Heyerdahl commissioned the island's inhabitants to re-erect one of the fallen statues. Through sweat and toil they accomplished the task by using the "heave-ho" approach Von Däniken disparaged. Despite such convincing counter-evidence, Von Däniken's conjecture lives on as fantasy fodder for numerous books and cable television documentaries on the unexplained.

Similarly, the Nazca effigies—which may have had astronomical/religious significance—are clearly associated with the ancient Nazca Indian culture. A front-cover story in SKEPTICAL INQUIRER (Spring 1983) demonstrated how such giant figures, such as the 440-foot-long "condor," could be duplicated using only sticks and cord, together with some "native" ingenuity. As to the possibility of extraterrestrials landing on the soft desert, the late Nazca expert Maria Reiche commented: "I'm afraid the spacemen would've gotten stuck."

Skull of Doom

A remarkable rock-crystal death's head, supposedly fashioned without the aid of tools, has been attributed to the mythical sunken continent of Atlantis. Its owner, Anna Mitchell-Hedges, claims she found it on her seventeenth birthday during her adoptive father's excavation of the lost Mayan city of Lubaantun in Belize (then British Honduras). Once said to bode ill to anyone who would mock it, the crystal skull has been rehabilitated by New Agers who claim it has powers of fortune telling and healing.

Actually the artifact, which does show evidence of tool work, resembles rock-crystal skulls made by the Aztecs as a symbol of death. Not only is there no proof Miss Mitchell-Hedges was at Lubaantun but documentary evidence proves her father simply bought the item at a Sotheby's sale. And there is no scientific evidence that the famous skull has properties different from other crystalline quartz. (See Joe Nickell with John F. Fischer, *Secrets of the Supernatural*, Amherst, N.Y.: Prometheus Books, 1988, pp. 29–46.)

The "Skull of Doom" of Lubaantun

Image of Guadalupe

A portrait of the Virgin Mary, said to be "made without hands" and to be scientifically inexplicable, is enshrined in a Mexico City church. Attracting more pilgrims than any other Catholic shrine except the Vatican, the image is widely reproduced in the form of icons, religions medals, neon signs, even tattoos. According to pious legend, it appeared as a "sign" on a peasant's cloak, just after the Spanish conquest. Due in part to confusion of the image with that of their own Virgin goddess, Tonantzin, the Aztecs were soon converted to Catholicism.

In fact, if the image were not scientifically explained it would be because independent scientists are not permitted to examine it. However, photographic enlargements show obvious signs of artistry, including some places where paint has obscured the cloth's weave and others where it has cracked. Infrared photos reveal preparatory sketch lines beneath the paint. Also, the image copies traditional Spanish portraits of Mary, and there is a report from an investigation of 1556 that the work was done by an Indian painter named Marcos. (See SKEPTICAL INQUIRER, Spring 1985, pp. 243–255.)

El Chupacabras

In 1995, reports of a bloodthirsty beast known as El Chupacabras ("the goat-sucker") spread from Puerto Rico to Mexico and the southern United States. The bulging eyed, reptilian creature—variously assigned an extraterrestrial or supernatural origin—reportedly attacked goats, rabbits, dogs, and cattle, sucking all the blood from them.

Investigation, however, soon showed the animals were not drained of blood, and stakeouts invariably yielded nothing more exotic than wild dogs. The rest was mass hysteria spread largely by sensationalized media reports. (See SKEPTICAL INQUIRER, September/October 1996, p. 12.)

Miraculous Surgery

Called "the surgeon of the rusty knife," Brazil's José Arigo (1921–1971) supposedly performed operations with little pain or blood and no infection. Despite folktales of his prowess, however, it appears that Arigo simply performed primitive surgeries like lancing boils or removing cysts, while prescribing antibiotics and mumbo-jumbo remedies. (His brother ran the only pharmacy in the village.)

Other Brazilian healers have prac-

ticed "psychic surgery" whereby "tumors" or other diseased tissue are supposedly removed with bare hands. Common also to the Philippines, such effects are fraudulently produced by sleight of hand using animal tissue and blood. (See SKEPTICAL INQUIRER, Fall/Winter 1977, pp. 104–110.)

Mexican UFO Wave

During the 1990s, Mexico City and nearby locales have been abuzz with flying saucers—or at least unidentified flying objects. For example, in 1991 a total solar eclipse attracted numerous sky-watchers whose camcorders captured luminous UFOs hovering overhead. And subsequent years brought additional amateur and commercial footage of various "inexplicable" phenomena.

While some waxed eloquent about Mayan cosmology, skeptics observed that some of the photogenic UFOs were positioned precisely where Venus and other planets and stars had been, and that other video sequences were indistinguishable from hoaxes. (For more on UFOs see Philip J. Klass, *UFOs Explained,* New York: Vintage, 1976.)

Carlos Castaneda and don Juan

Feeding on the New Age infatuation and drug culture of the 1970s, anthropologist Carlos Castaneda (1925–1998) claimed to be America's first-hand chronicler of don Juan Matus, a Yaquis Indian sorcerer in Mexico whose powers included dream transport. Castaneda devoted his Ph.D. dissertation at UCLA and many best-selling books to the art, magic, and life of don Juan. In the process, Castaneda's extraordinary stories helped inspire a close following of devotees and the fad of spiritual shamanism.

Allegedly based on field experience, observations, and interviews with the sorcerer among the exotic flora and fauna of the Mexican desert, Castaneda's accounts are undermined by discrepancies in narrative time flow and by peculiar inconsistencies in language. For example, don Juan never speaks Yaqui nor does he use Spanish. Few names of Mexican plants are provided other than Jimson weed, mescal, and hallucinogenic mushrooms. As author Gordon Stein points out, although a "smoking gun" proving don Juan a hoax has not surfaced, strong circumstantial evidence shows Castaneda's books rely on information borrowed from other published sources, and not on field observations of a Yaqui sorcerer. (See SKEPTICAL INQUIRER, Spring/Summer 1977, and Spring/Summer 1978.)

* * *

As these examples indicate, the exotic lands to the south are intriguing in their own right. Charlatans, mystery mongers, and hoaxers, many times in an effort to package and sell sensationalism to the media, simply divert attention from the genuine wonders and mysteries that are best left to the pursuit of science and reason.

—Joe Nickell and Matt Nisbet

Joe Nickell is Investigative Files columnist for SKEPTICAL INQUIRER. *Matt Nisbet is Public Relations Director for the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP).*

Maria Reiche, Nazca Lines' Guardian, Dies

Maria Reiche, famed guardian of the Nazca Lines, died June 8 at the age of ninety-five. A German mathematician, Reiche devoted her last fifty years to preserving and studying the geometric designs and giant stylized animal effigies—a monkey, spider, various birds and other figures—etched into the Peruvian desert.

Although they were clearly made by the Nazca Indian culture, probably between 200 B.E.C. and 600 C.E., books such as Erich von Däniken's *Chariots of the Gods?* attributed them to "ancient astronauts" (who supposedly also helped create the pyramids of Egypt and the stone heads on Easter Island). But Reiche, who expended her own money to create a foundation to preserve the fragile lines, discounted the notion that extraterrestrials had landed on the soft pampas.

At her death authorities in the town of Nazca proclaimed a day of mourning, and German and Peruvian flags were lowered to half-staff. Peruvian President Alberto Fujimori, visiting the United States at the time, told reporters, "This is a really painful and sad loss for Peruvian archaeology." How painful a loss was underscored just two months after her death. American tourists driving their van across the arid plain scarred the designs with tire tracks that, according to the Associated Press, "will remain for centuries."

—Joe Nickell

Tolstoy Predicts Bulls' Sixth Championship (in Code of Course)

As my wife and I were driving through New Mexico, on Sunday, June 14, 1998, we listened to game six of the Chicago Bulls/Utah Jazz National Basketball Association (NBA) playoffs. As the game drew to a close, we heard the Utah crowd groan as Michael Jordan sank the winning basket. And then and there, a chill went down my spine. "Oh my God," I thought to myself. "The Tolstoy Code is real."

Fifty days (more than seven weeks) before, on April 27, I had undertaken a search for NBA teams and players using the technique of 'equidistant letter sequences' popularized in the book *The Bible Code,* by Michael Drosnin (Simon & Schuster, 1997). But I wasn't searching in the Hebrew Torah—instead, I was looking in book one of an English translation of Leo Tolstoy's epic, *War and Peace* (see my SKEPTICAL INQUIRER arti-

cles on the Bible Code, November/December 1997 and March/April 1998).

I had wondered if the NBA playoff winner could actually be predicted in advance. What did my April search reveal? "Chicago" was found encoded just once in *War and Peace,* at a step of 8891 characters (and therefore 100 percent 'minimal,' i.e. having the shortest step for that word). Ominously, "Jazz" was not encoded at all.

But there was more! "Bulls" was also encoded thirty-two times in Book 1 of *War and Peace,* and of these, five matches had non-zero domains of minimality. Amazingly, "Chicago" and one of the minimal (shortest-step) "Bulls" appeared close to each other in a classic "Bible-code" crossword puzzle. I also found fourteen hidden occurrences of "Jordan," and one of these (minimal step, of course) made an excellent, small puzzle with one of the minimal "Bulls."

With all these "Bible Code" indicators flashing—matching of long words, proximity of paired matches, and strict use of "minimal" matches—I rushed to send my prediction to several reporters and scientists. I thought about trying to warn Karl "the Mailman" Malone of the Jazz—but I decided to let history run its course. When I made my prediction, there were sixteen teams in the playoffs. And the Bulls, while favored, almost lost it all on more than one occasion. In fact, the Indiana Pacers came very close to defeating them, but Tolstoy's Bulls clung to their destiny.

And on June 14, my prediction came to pass. Not only had Tolstoy predicted the victors would be the Chicago Bulls, but Jordan's key role in the victory had been forecast—almost two months in advance.

And now, we are left to ponder the somber truth.

Either the "Bible Code" nonsense is just a general, arcane mathematical technique which can be employed to find any desired messages or predictions, hidden in any book or text. . . .

. . . Or Leo Tolstoy is the Supreme Being who created the universe.

CHICAGO: plot step N=8891

ncesfixedonhimbythedo
ethevilesu**C**ceediknoww
ierrethoug**H**titnecessa
iseyesthes**I**ckmanwastu
wnoinfluen**C**einpolitic
apegraceth**A**tisallihav
toasmileof**G**litteringt
sfavoritet**O**pichelooke
ewillsaveandhavemercy

BULLS: plot step = 889

Ireallycatichecantyou
ntbelievemethenbeliev
ificedmy**S**elfbutonlyth
utohaveasgoodanopinio
outitsooneritsinthein
adespeop**L**eranhurriedl
themyesrepliedafootma
seroomsannamikhaylovn
sheinrep**L**ytohislookan
ousnessthatthedecisiv
naparticularlyrespect
nhiswayb**U**tallatoncehe
tiswellandheturnedtog
trangeladytheaidedeca
overfrom**B**ehindthechai
youbehindhimstoodthea

JORDAN: plot step =1024

hovandabouthisillegitimatesonpierr
etheonee**J**ustfancythosethreegothold
ofabearsomewheedinthec**O**nversatio
nevidentlywishingtoshowuntcyrilvla
dimi**R**ovichhearinghowillheisbutide
spreadhisarmswidean**D**threwthemro
undtheloulddnothelpjoininginnowth
engo**A**wayandtakeyabletosuppressth
eirlaughterthetwoyou**N**gmenreadysh
eansweredreturninghissmileborisqui

—David E. Thomas

David E. Thomas is a SKEPTICAL INQUIRER consulting editor.

The Pseudoscience of Ear Wax Removal

A fine example of pseudoscience is "ear candling," a current practice popular with customers of organic grocery and health food stores where the candles are

Figure 1. Ear candling in progress.

sold. Manufacturers of these products claim or strongly imply that ear candling will facilitate the removal of wax or cerumen from the ear.

For example, the "Wally's Candles, A Home Remedy" brochure that accompanies a package of two ear candles (which costs approximately seven dollars) states that these candles, "have been reported to aid in cleansing the ear, improve hearing and bring soothing comfort to the user." The brochure continues with a list of statements concerning how ear wax build-up can lead to "hearing loss, infections, ringing-of-the-ears, headaches, congestion and loss of balance."

The candle, which is more accurately described as a cone or funnel since it is hollow, consists of beeswax and cotton cloth. The process of ear candling begins by placing the narrow end of the tapered candle just inside the ear as the person lies flat on one side of their body (see Figure 1). The top of the candle is then ignited and once half the candle burns, it is removed and extinguished; an aluminum pie pan is usually used to collect any burning debris. The burning of the candle supposedly creates a negative pressure inside the ear, drawing ear wax up and out of the ear. When the candle is cut open (this is not part of the manufacturer's instructions), a fairly large deposit of a dried yellow solid is found inside (see Figure 2). This substance is easily mistaken as wax from the person's ear, but in reality it is the beeswax from

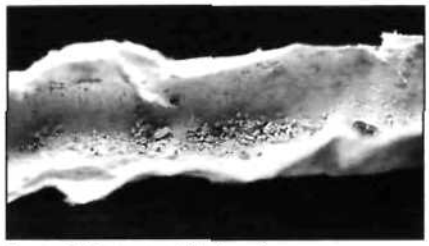

Figure 2. Beeswax mistaken for earwax.

the candle itself. The beeswax is extracted into the inside space of the candle by a pressure differential. As the oxygen inside the candle is consumed during combustion, the atmospheric pressure inside the candle decreases. This allows some of the wax to travel from the candle itself into the empty space inside the candle. When the candle is cut open, the wax observed is in the form of a dried powder since moisture is evaporated during the burning process.

Two simple tests can be performed to show that no earwax is indeed removed by the candling procedure. First, acquire a small clean test tube (to simulate the narrow ear canal) and into it add a weighed piece of wax, preferably human earwax. Heat the test tube containing the wax to body temperature in a hot water bath. Next, fit the candle into the test tube and then ignite the top of the candle with a match. After about half the candle has burned, extinguish the flame. When one examines the test tube containing the human earwax during the burning process, it will be observed that the earwax does not change in any way; it neither travels up the test tube nor does it enter the candle. The mass of the human earwax before and after candling is the same. Furthermore, when one opens up the bottom tip of the partially burned candle, the dried solid is observed to be in a quantity greater than the earwax placed in the test tube. This simulation strongly suggests that none of the human earwax is being removed by the candling process, but instead, the extracted substance originates from the candle itself.

A second test supports these findings. When the above procedure is repeated but without any human earwax in the test tube, the same result occurs—a yellow dried solid is found inside the bottom tip of the candle.

The results of these tests are further supported by a recent medical study evaluating the efficacy and safety of ear candling (Seely et al. 1996). In a limited clinical trial (eight patients), it was found using tympanometric measurements that ear candles did not produce a negative pressure inside the ear nor did the candles remove cerumen from the ear as claimed. Furthermore, in a survey of 122 otolaryngologists, twenty-one ear injuries were identified resulting from using ear candles. In the definitive words of the authors, "Ear candles have no benefit in the management of cerumen and may result in serious injury."

—Stephen DeMeo

Stephen DeMeo is in the Department of Chemistry, City University of New York at York College in Jamaica, NY 11451.

Note

Seely, D.R., Quigley, S.M., Langman, A.W. (1996). "Ear candles—efficacy and safety," *Laryngoscope* 106 (10): 1226–9.

Council Against Health Fraud Concerned About Veterinary Pseudoscience

The National Council Against Health Fraud has expressed concern to the American Veterinary Medical Association over their "AVMA Guidelines for Alternative and Complementary Veterinary Medicine." The Guidelines were adopted in 1996, on the advice of a six-member committee chaired by Dr. Stanley Held.

The Council recently issued a letter of objection to the Guidelines, endorsed by over 150 people, including many scientists, physicians, and editors from medical publications. They object to the Guidelines on many grounds, including: that they contain inaccurate and misleading statements; they assert the efficacy of unproven therapies such as chiropractic and homeopathy; and that the AVMA, by embracing such unproven therapies, is in effect working against the public interest.

Some excerpts: "No mention whatever is made of our responsibility to base *any* therapy we employ on the best available science. In fact, the word 'science' appears exactly nowhere in the 'Guidelines.' We believe this is a telling omission. . . . Including unproven and unscientific therapies under the 'standard of practice' umbrella, merely serves to lower that standard, and make the AVMA, itself, vulnerable to liability. . . . By 'exempting' veterinary practitioners from any requirement for scientific rigor, the AVMA has in effect exempted itself from serious consideration by the scientific community. They have, thereby, diminished the scientific standing of the entire profession."

The letter is set to appear in an upcoming issue of the *Scientific Review of Alternative Medicine.*

The Council Against Health Fraud maintains a Web site at http://www.seanet.com/~vettf/.

—Benjamin Radford

'The Straight Dope' is Colorful, Critical Thinking

His improvised experiments and acerbic style aren't likely to land him any publications in scientific journals, but for thousands of newspaper readers around the country, Cecil Adams provides a scientific point of view on all kinds of wild claims and weird stories. His "Straight Dope" column deals with topics such as end-of-the-world prophecies, zinc tablets, UFOs, remote viewing, exploding birds, and the reason why clouds—if they're so heavy—float.

Readers write in with questions, and Adams researches the answers. It is much like an advice column, except the questions must be factual and the modest, tongue-in-cheek aim is to "eradicate world ignorance." Adams isn't shy about throwing in sexual or scatological humor

(in fact, he throws it in whenever possible), proving that critical thinking can be colorful. He's not squeamish about pursuing topics some might consider trivial or in questionable taste, either.

Some "Straight Dope" findings: duck's quacks do echo; aliens didn't land at Roswell; the touted "laundry disks" clean clothes no better than hot water (and, interestingly enough, neither does laundry detergent); and, finally, nobody seems to know, exactly, the physical forces at work when one sucks a strand of spaghetti into one's mouth.

For a skeptic, "The Straight Dope" is a welcome antidote to the astrology columns. It started back in 1973 at *The Chicago Reader,* and now appears in more than thirty newspapers throughout the United States and Canada, including *The Boston Phoenix, Philadelphia Weekly,* and *The Washington City Paper.* Small, "alternative" papers are most open to the column. Three *Straight Dope* books have been published by Ballatine, and a television show aired on the Arts & Entertainment cable network in 1996. According to the "Straight Dope" Web site, another television show is planned for the future. To access the site, visit the Straight Dope area at America Online, keyword: Straight Dope.

—Jeff Minerd

Jeff Minerd edits Writer's Carousel, *a writer's publication in Washington, D.C.* □

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Science and the Unknowable

Existence, the preposterous miracle of existence! To whom has the world of opening day never come as an unbelievable sight? And to whom have the stars overhead and the hand and voice nearby never appeared as unutterably wonderful, totally beyond understanding? I know of no great thinker of any land or era who does not regard existence as the mystery of all mysteries.

—John Archibald Wheeler

One of the fundamental conflicts in philosophy, perhaps the most fundamental, is between those who believe that the universe open to our perception and exploration is all there is, and those who regard the universe we know as an extremely small part of an unthinkably vaster reality. These two views were taken by those two giants of ancient Greek philosophy, Plato and Aristotle. Plato, in his famous cave allegory, likened the world we experience to the shadows on the wall of a cave. To turn this into a mathematical metaphor, our universe is like a projection onto three-dimensional space of a much larger realm in a higher space-time.

For Aristotle the universe we see, although parts of it are beyond human comprehension, is everything. It is a steady-state cosmos, self-caused, having no beginning or end. There is no Platonic realm of transcendent realities and deities. Plato succumbed to what Paul Kurtz likes to call the "transcendental temptation." Aristotle managed to avoid it.

In recent years cosmologists have blurred the distinction between the universe we know and transcendent regions by positing a "multiverse" in which an infinity of universes are continually exploding into existence, each with a unique set of laws and constants. This is one way to defend the anthropic principle against the argument that the universe's fine tuning is evidence of a Designer. It is known that if any of some dozen constants is altered by a minuscule fraction it would not be possible for suns and planets to form, let alone life to evolve. The counter argument: If there is an infinity of universes, each with an unplanned, random set of constants, then obviously we must exist only in a universe with constants that permit life to evolve.

The multiverse concept, however, is far from a step toward Platonic transcendence. The other universes do not differ from ours in any truly fundamental way. They all spring into being in response to random fluctuations in the same laws of quantum mechanics, varying only in the accidental way their Big Bang creates laws. There is still no need to leap from a godless nature to transcendental regions that somehow lie beyond the multiverse.

A few cosmologists and far-out philosophers have gone much further. They conjecture that all possible universes exist—that is, every universe based on a noncontradictory set of laws. In the many-worlds interpretation of quantum mechanics, the universe is constantly splitting into parallel worlds, but these countless worlds all obey the same laws. The multi-multiverse of all-possible-worlds is a much larger ensemble, obviously infinite because the number of logically consistent possibilities is infinite. Most physicists do not buy this view because it is the utmost imaginable violation of Occam's razor. Leibniz's notion of a Creator who surveyed all logically possible worlds, then selected what She considered the most desirable, is surely a simpler conjecture by many orders of magnitude.

A question now arises. As science steadily advances in its knowledge of nature, never reaching absolute certainty but always getting closer and closer to understanding nature, will it eventually discover everything?

We have to be careful to define what is meant by "everything." There is a trivial sense in which humanity cannot possibly know all there is to know. We will never know how many hairs were on Plato's head when he died, or whether Jesus sneezed while delivering the

Martin Gardner's latest book is The Last Recreations *(Springer-Verlag, Copernicus, 1997), a collection of twenty-three of his* Scientific American *columns from the last seven years before his retirement from the magazine in 1981.*

Sermon on the Mount. We will never know all the decimal digits of pi, or all possible theorems of geometry. We will never know all possible theorems just about triangles. We will never know all possible melodies, or poems, or novels, or paintings, or jokes, or magic tricks because the possible combinations are limitless. Moreover, as Kurt Gödel taught us, every mathematical system complex enough to include arithmetic contains theorems that cannot be proved true or false within the system. Whether Gödelian undecidability may apply to mathematical physics is not yet known.

When physicists talk about TOEs (Theories of Everything) they mean something far less trivial. They mean that all the fundamental laws of physics eventually will became known, perhaps unified by a single equation or a small set of equations. If this happens, and physicists find what John Wheeler calls the Holy Grail, it will of course leave unknown billions and billions of questions about the complexities that emerge from the fundamental laws.

At the moment, cosmologists do not know the nature of "dark matter" that holds together galaxies, or how fast the universe is expanding, and hundreds of other unanswered questions. Biologists do not know how life arose on Earth or whether there is life on planets in other solar systems. Evolution is a fact, but deep mysteries remain about how it operates. No one has any idea how complex organic molecules are able to fold so rapidly into the shapes that allow them to perform their functions in living organisms. No one knows how consciousness emerges from the brain's complicated molecular structure. We do not even know how the brain remembers.

Such a list of unknowns could fill a book, but all of them are potentially knowable if humanity survives long enough. Too often in the past scientists have decided that something is permanently unknowable only to be contradicted a few generations later. On the other hand, many scientists have predicted that physics was near the end of its road only to have enormous new revolutions of knowledge take place a few decades later.

In recent years, just when it was thought that all the basic particles had been found or conjectured, along came superstrings, the most likely candidate at the moment for a TOE. If superstring theory is correct, it means that all fundamental particles are made of incredibly tiny loops of enormous tensile strength. The way they vibrate generates the entire zoo of particles.

There is no escape from the superultimate questions: Why is there something rather than nothing, and why is the something structured the way it is?

What are superstrings made of? As far as anyone knows they are not made of anything. They are pure mathematical constructs. If superstrings are the end of the line, then everything that exists in our universe, including you and me, is a mathematical construction. As a friend once said, the universe seems to be made of nothing, yet somehow it manages to exist.

On the other hand, superstrings may, at some future time, turn out to be composed of still smaller entities. Many famous scientists, notably Arthur Stanley Eddington, David Bohm, Eugene Wigner, Freeman Dyson, and Stanislaw Ulam, believed that the universe has bottomless levels. As soon as one level is penetrated, a trap door opens to a hitherto unsuspected sub-basement. These sub-basements are infinite. As the old joke goes, it's turtles all the way down. Here is how Isaac Asimov expressed this opinion in his autobiography *I, Asimov*: "I believe that scientific knowledge has fractal properties; that no matter how much we learn, whatever is left, however small it may seem, is just as infinitely complex as the whole was to start with. That, I think, is the secret of the Universe."

A similar infinity may go the other way. Our universe may be part of a multiverse, in turn part of a multi-multiverse, and so on without end. As one of H.G. Wells' fantasies has it, our cosmos may be a molecule in a ring on a gigantic hand.

Even if the universe is finite in both directions, and there are no other worlds, are there fundamental questions that can never be answered? The slightest reflection demands a yes.

Suppose that at some future date a TOE will provide all the basic laws and constants. Explanation consists of finding a general law that explains a fact or a less general law. Why does Earth go around the sun? Because it obeys the laws of gravity. Why are there laws of gravity? Because, Einstein revealed, large masses distort space-time, causing objects to move along geodesic paths. Why do objects take geodesic paths? Because they are the shortest paths through space-time. Why do objects take the shortest paths? Now we hit a stone wall. Time, space, and change are given aspects of reality. You can't define any of these concepts without introducing the concept into the definition. They are not mere aspects of human consciousness, as Kant imagined. They are "out there," independent of you and me. They may be unknowable in the sense that there is no way to explain them by embedding them in more general laws.

Imagine that physicists finally discover all the basic waves and their particles, and all the basic laws, and unite everything in one equation. We can then ask "Why that equation?" It is fashionable now to conjecture that the Big Bang was caused by a random quantum fluctuation in a vacuum devoid of space and time. But of course such a vacuum is a far cry from nothing. There had to be quantum laws to fluctuate. And why are there quantum laws?

Even if quantum mechanics becomes "explained" as part of a deeper theory—call it X—as Einstein believed it eventually would be, then we can ask "Why X?" There is no escape from the superultimate questions: Why is there something rather than nothing, and why is the something structured the way it is?" As Stephen Hawking recently put it, "Why does the universe go to all the bother of existing?"

The question obviously can never be answered, yet it is not emotionally meaningless. Meditating on it can induce what William James called an "ontological wonder-sickness." Jean Paul Sartre called it "nausea." Fortunately such reactions are short-lived or one could go mad by inhaling what James called "the blighting breath of the ultimate why."

Consider the extremely short time humanity has been evolving on our little planet. It seems unlikely that evolution has stopped with us. Can anyone believe that a million years from now, if humanity lasts, that our brains will not have evolved far beyond their present capacities? Our nearest relatives, the chimpanzees, are incapable of understanding why three times three is nine, or anything else taught in grade school. It is difficult to imagine that a million years from now our brains will not be grasping truths about the universe that are as far beyond what we now can know as our understanding is beyond the mind of a monkey. To suppose that our brains, at this stage of an endless process of evolution, are capable of knowing everything that can be known strikes me as the ultimate in hubris.

If one is a theist, obviously there is a vast unknowable reality, transcending our universe, a "wholly other" realm impossible to contemplate without an emotion of what Rudolph Otto called the *mysterium tremendum.* But even if one is an atheist or agnostic, the Unknowable will not go away. No philosopher has written more persuasively about this than agnostic Herbert Spencer in the opening chapters of his *First Principles* (1894).

On the beginning hundred pages of this book, in a part titled "The Unknowable," Spencer argues that a recognition of the Unknowable is the only way to reconcile science with religion. The emotion behind all religions, aside from their obvious superstitions and gross beliefs, is one of awe toward the impenetrable mysteries of the universe. Here is how Spencer reasoned:

> One other consideration should not be overlooked—a consideration which students of Science more especially need to have pointed out. Occupied as such are with established truths, and accustomed to regard things not already known as things to be hereafter discovered, they are liable to forget that information, however extensive it may become, can never satisfy inquiry. Positive knowledge does not, and never can, fill the whole region of possible thought. At the uttermost reach of discovery there arises, and must ever arise, the question—What lies beyond? As it is impossible to think of a limit to space so as to exclude the idea of space lying outside that limit; so we cannot conceive of any explanation profound enough to exclude the question—What is the explanation of that explanation? Regarding Science as a gradually increasing sphere, we may say that every addition to its surface does but bring it into wider contact with surrounding nescience. There must ever remain therefore two antithetical modes of mental action. Throughout all future time, as now, the human mind may occupy itself, not only with ascertained phenomena and their relations, but also with that unascertained something which phenomena and their relations imply. Hence if knowledge cannot monopolize consciousness—if it must always continue possible for the mind to dwell upon that which transcends knowledge, then there can never cease to be a place for something of the nature of Religion; since Religion under all its forms is distinguished from everything else in this, that its subject matter passes the sphere of the intellect.

By "Religion" Spencer did not mean religion in the usual sense of worshipping God or gods, but only a sense of awe and wonder toward ultimate mysteries. For him Science and Religion were two essential aspects of thought; Science expressing the knowable, Religion the unknowable. The two merge without contradiction, "If Religion and Science are to be reconciled," he writes, "the basis of reconciliation must be this deepest, widest, most certain of all facts—that the Power which the Universe manifests to us is inscrutable."

No matter how many levels of generalization are made in explaining facts and laws, the levels must necessarily reach a limit beyond which science is powerless to penetrate.

> In all directions his investigations eventually bring him face to face with an insoluble enigma; and he ever more clearly perceives it to be an insoluble enigma. He learns at once the greatness and the littleness of the human intellect—its power in dealing with all that comes within the range of experience, its impotence in dealing with all that transcends experience. He, more than any other, truly *knows* that in its ultimate nature nothing can be known.

The rest of Spencer's *First Principles,* titled "The Knowable," is an effort to summarize the science of his day, especially what was then known about evolution.

> But an account of the Transformation of Things, given in the pages which follow, is simply an orderly presentation of facts; and the interpretation of the facts is nothing more than a statement of the ultimate uniformities they present— the laws to which they conform. Is the reader an atheist? The exposition of these facts and these laws will neither yield support to his belief nor destroy it. Is he a pantheist? The phenomena and the inferences as now to be set forth will not force on him any incongruous implication. Does he think that God is immanent throughout all things, from concentrating nebulae to the thoughts of poets? Then the theory to be put before him contains no disproof of that view. Does he believe in a Deity who has "given unchanging laws to the Universe? Then he will find nothing at variance with his belief in an exposition of those laws and an account of the results.

Boundaries and Barriers: On the Limits of Scientific Knowledge (Addison-Wesley, 1996), edited by John Casti and Anders Karlqvist, is one of a spate of recent books on the topic. For almost all its authors, the term "limits" is confined to unsolved but potentially solvable questions. Most of the authors agree with what the editors say in their introduction: "Unlike mathematics, there is no knock-down airtight argument to believe that there are questions about the rest of the world that we cannot answer in principle."

Only British astronomer John Barrow has the humility to disagree. He concludes his contribution as follows:

> In this brief survey we have explored some of the ways in which the quest

for a Theory of Everything in the third millennium might find itself confronting impassable barriers. We have seen there are limitations imposed by human intellectual capabilities, as well as by the scope of technology. There is no reason why the most fundamental aspects of the laws of nature should be within the grasp of human minds, which evolved for quite different purposes, nor why those laws should have testable consequences at the moderate energies and temperatures that necessarily characterize life-supporting planetary environments. There are further barriers to the questions we may ask of the universe, and the answers that it can provide us with. These are barriers imposed by the nature of knowledge itself, not by human fallibility or technical limitations. As we probe deeper into the intertwined logical structures that underwrite the nature of reality, we can expect to find more of these deep results which limit what can be known. Ultimately, we may even find that their totality characterizes the universe more precisely than the catalogue of those things that we can know.

Barrow later expanded these sentiments in his 1998 book *Impossibility: The Limits of Science and the Science of Limits* (Oxford University Press). Here are some passages from his final courageous chapter:

> The idea that some things may be unachievable or unimaginable tends to produce an explosion of knee-jerk reactions amongst scientific (and not so scientific) commentators. Some see it as an affront to the spirit of human inquiry: raising the white flag to the forces of ignorance. Others fear that talk of the impossible plays into the hands of the anti-scientists, airing doubts that should be left unsaid lest they undermine the public perception of science as a never-ending success story . . . .
>
> We live in strange times. We also live in strange places. As we probe deeper into the intertwined logical structures that underwrite the nature of reality, I believe that we can expect to find more of these deep results which limit what can be known. Our knowledge about the Universe has an edge. Ultimately, we may even find that the fractal edge of our knowledge of the Universe defines its character more precisely than its contents; that what cannot be known is more revealing than what can.

George Gamow once described science as an expanding circle, not on a plane but on a sphere. It reaches a maximum size, after which it starts to contract until finally the sphere is covered and no more fundamental knowledge about the universe remains. In recent years numerous physicists, Hawking for instance, have expressed similar hopes. Richard Feynman suggested that although the circle may start to contract, it will become ever more difficult to obtain new knowledge and close the circle completely.

That science will soon discover everything is far from a recent hope. William James, lecturing at Harvard more than a century ago, attacked the hope with these words:

> In this very University. . . I have heard more than one teacher say that all the fundamental conceptions of truth have already been found by science, and that the future has only the details of the picture to fill in. But the slightest reflection . . . will suffice to show how barbaric such notions are. They show such a lack of scientific imagination, that it is hard to see how one who is actively advancing any part of science can make a mistake so crude . . . .
>
> Our science is a drop, our ignorance a sea. Whatever else be certain, this at least is certain—that the world of our present natural knowledge *is* enveloped in a larger world of *some* sort of whose residual properties we at present can frame no positive idea.

Infinite In All Directions, the title of Freeman Dyson's 1988 book, says it all. Near the close of his third chapter he has this to say about a different hope:

> It is my hope that we may be able to prove the world of physics as inexhaustible as the world of mathematics. Some of our colleagues in particle physics think that they are coming close to a complete understanding of the basic laws of nature. They have indeed made wonderful progress in the last ten years. But I hope that the notion of a final statement of the laws of physics will prove as illusory as the notion of a formal decision process for all of mathematics. If it should turn out that the whole of physical reality can be described by a finite set of equations, I would be disappointed. I would feel that the Creator had been uncharacteristically lacking in imagination. I would have to say, as Einstein once said in a similar context, "Da könnt' mir halt der liebe Gott leid tun" ("Then I would have been sorry for the dear Lord"). □

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INVESTIGATIVE FILES

JOE NICKELL

Helix to Heaven

The Staircase Stands but the Myth Falls

The CBS television movie "The Staircase" (April 12, 1998), told how "a dying nun's wish to complete her order's chapel is fulfilled by a mysterious stranger" (Bobbin 1998). Starring Barbara Hershey as the terminally ill mother superior and William Peterson as the enigmatic carpenter, the movie is an embellishment of the legend of the "miraculous stairway" at the Sisters of Loretto Chapel in Santa Fe, New Mexico. The wooden, spiral stair is thought to be unique, and some claim its very existence is inexplicable.

The Loretto legend begins with the founding of a school for females in Santa Fe in 1852. A combined day and boarding school, the Loretto Academy was established by the local Sisters of Loretto at the behest of Bishop John Lamy. In 1873 work began on a chapel. Unfortunately some earthly, even earthy events reportedly marred the work: The wife of Bishop Lamy's nephew caught the architect's eye and he was killed for his interest—shot by the nephew who was distraught over his destroyed marriage.

At this time work on the chapel was nearing completion and, although the choir loft was finished, the architect's plans provided no means of access. It was felt that installing an "ordinary stair" would be objectionable on aesthetic grounds and because it would limit seating (Bullock 1978, 6, 8). "Carpenters and builders were called in," according to one source, "only to shake their heads in despair." Then, "When all else had failed, the Sisters determined to pray a novena to the Master Carpenter himself, St. Joseph" (the father of Jesus) (Bullock 1978, 8).

"On the ninth day," reportedly, their prayers were answered. A humble workman appeared outside, leading a burro laden with carpentry tools. He announced he could provide a suitable means of access to the loft, requiring only permission and a couple of water tubs. Soon, he was at work:

> Sisters, going in to the Chapel to pray, saw the tubs with wood soaking in them, but the Man always withdrew while they said their prayers, returning to his work when the Chapel was free. Some there are who say the circular stair which stands there today was built very quickly. Others say no, it took quite a little time. But the stair did grow, rising solidly in a double helix without support of any kind and without nail or screw. The floor space used was minimal and the stair adds to, rather than detracts from, the beauty of the Chapel.

As the tale continues:

> The Sisters were overjoyed and planned a fine dinner to honor the Carpenter. Only he could not be found. No one seemed to know him, where he lived, nothing. Lumberyards were checked, but they had no bill for the Sisters of Loretto. They had not sold him the wood. Knowledgeable men went in and inspected the stair and none knew what kind of wood had been used, certainly nothing indigenous to this area. Advertisements for the Carpenter were run in the *New Mexican* and brought no response.
>
> "Surely," said the devout, "it was St. Joseph himself who built the stair" (Bullock 1978, 8, 10).

No doubt the legend has improved over the intervening century, like good wine. As we shall see, there is more to the story. But Barbara Hershey concedes, "Those who want to believe it's a miracle can, and those who want to believe this man was just an ingenious carpenter can" (Bobbin 1998). Evidence for the latter is considerable, but first we must digress a bit to understand spiral stairs.

Spiral and other winding staircases reached a high point in development in sixteenth-century England and France, with several "remarkable" examples ("Stair" 1960; "Interior" 1960). To appreciate the architectural and other problems such stairs present we must recognize that builders use *turns* in staircases to save space or to adapt to a particular floor plan. The simplest is the *landing turn* which is formed of straight flights joined at the requisite angle by a platform. A variation is the *split landing* which is divided on a diagonal into two steps.

Instead of a landing, the turn may be

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accomplished by a series of steps having tapered treads. Such staircases are called *winders* and include certain ornamental types, like that which takes the shape of a partial circle (known as circular stair) or an ellipse. An extreme form of winding staircase is a *continuous winder* in the form of a helix (a line that rises as it twists, like a screw thread). This is the popularly termed "spiral staircase" like the example at Loretto Chapel (Locke 1992, 135–36; Dietz 1991, 340–42).

Helixes—unlike, say, pyramids—are not inherently stable weight-supporting structures. They require some kind of strengthening or support. Therefore, in addition to being secured at top and bottom, the spiral staircase is usually also braced by attachment along its height to a central pole or an adjacent wall (Dietz 1991, 342; "Stair" 1960).

Unfortunately, spiral and other winding staircases are not only problematic in design but are also fundamentally unsafe. Explains one authority, "For safety, any departure from a straight staircase requires careful attention to detail in design and construction." Especially, "Because people tend to travel the shortest path around a corner, where a winder's treads are narrowest, the traveler must decide at each step where each foot falls. This may be an intellectual and physical exercise best practiced elsewhere. In short, winders are pretty but inherently unsafe" (Locke 1992, 135, 136). Other experts agree. According to Albert G. H. Dietz, Professor Emeritus of Building Engineering at MIT, Winders "should be avoided if at all possible. No adequate foothold is afforded at the angle [due to the tapering] and there is an almost vertical drop of several feet if a number of risers converge on the same point. The construction is dangerous and may easily lead to bad accidents" (Dietz 1991, 341). As a consequence, winders are frequently prohibited by building codes. That is especially true of the spiral stair, which "contains all the bad features of the winder multiplied several times" (Dietz 1991, 342).

Such problems seem to have beset the staircase at Loretto, suggesting that, at most, the "miracle" was a partial one.

Figure 1. The spiral stairway at Loretto Chapel in Santa Fe, New Mexico, is an alleged miracle of construction.

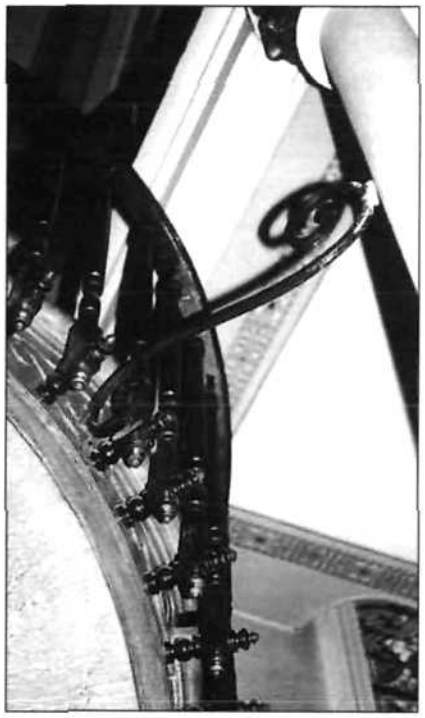

Figure 2. Iron support bracket (unmentioned in published accounts) reveals the "miracle" is a partial one. (Photos by Joe Nickell)

Safety appears to have been a concern at the outset, since there was originally no railing. At the time the staircase was completed, one thirteen-year-old sister who was among the first to ascend to the loft, told how she and her friends were so frightened—absent a railing—that they came down on hands and knees (Albach 1965). Nevertheless, despite the very real hazard, it was not until 1887—ten years after the staircase was completed—that an artisan named Phillip August Hesch added the railing (Loretto n.d.). No one claims it was a miracle, yet it is described as "itself a work of art" (Albach 1965; see Figure 1).

Over time, other problems arose relating to the double helix form. The helix, after all, is the shape of the common wire spring. Therefore, it is not surprising that people who trod the stairs reported "a small amount of vertical movement" or "a certain amount of springiness" (Albach 1965) and again "a very slight vibration as one ascends and descends rather as though the stair were a living, breathing thing" (Bullock 1978, 14).

Some people have thought the free-standing structure should have collapsed long ago, we are told, and builders and architects supposedly "never fail to marvel how it manages to stay in place," considering that it is "without a center support" (Albach 1965). In fact, though, as one wood technologist observes, "the staircase does have a central support." He observes that of the two wood stringers (or spiral structural members) the inner one is of such small radius that it "functions as an almost solid pole" (Easley 1997).

There is also another support—one that goes unmentioned, but which I observed when I visited the now-privately owned chapel in 1993. This is an iron brace or bracket that stabilizes the staircase by rigidly connecting the outer stringer to one of the columns that support the loft (see Figure 2).

There is reason to suspect that the staircase may be more unstable and, potentially, unsafe than some realize. It has been closed to public travel since at least the mid-1970s (when the reason was given as lack of other egress from the loft in case of fire). When I visited in 1993 my understanding was that it was suffering from the constant traffic. Barbara Hershey implied the same when

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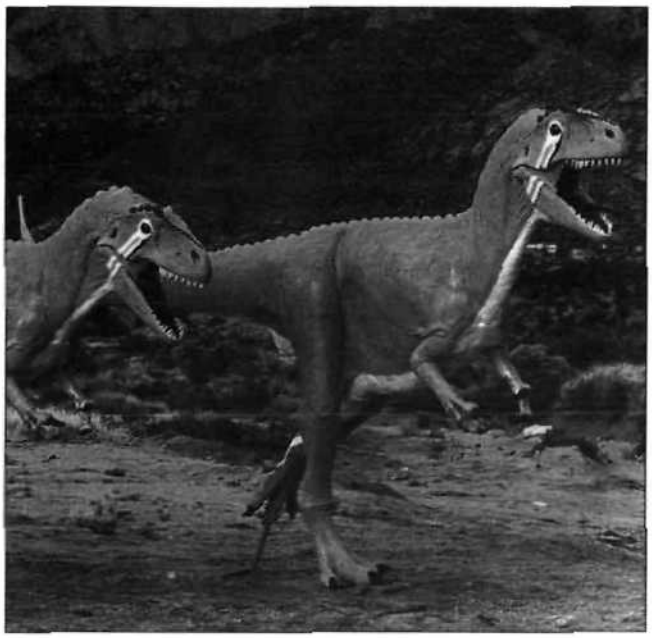
Gaps in the Fossil Record: A Case Study

Creationists often point out that there are gaps in the fossil record, as if that somehow invalidates it. The Morrison Formation illustrates the impossibility of an absolutely complete record—and the coherent, detailed picture it nevertheless gives of a time and place.

DAVID A. THOMAS

Creationists often point out that the fossil record has gaps, and they seem to think that those parts we do have are somehow invalidated because we don't have the entire record. It's as if the books in the public library were somehow made worthless because the library doesn't have every book ever published. The creationists' dream world is a sort of paleontological Forest Lawn Cemetery where all animals (and people) are carefully laid out and preserved. That this idealized concept does not conform to the jumbled, chaotic, infinitely complicated real world is in no way a failure of the real world. It is a failure of the concept.

Of course there are gaps in the fossil record, and always will be. For a fossil to be found, a complicated series of steps must occur in sequence. The first is that the animal (or plant) must be buried quickly. Animals that die on the plains



Allosaurs sculpted by the author using bones found in the Morrison Formation.

or in the mountains are soon found by scavengers, such as hyenas or ceratosaurs, and soon reduced to bone chips. Most animals that are fossilized are caught in a flash flood, or die in or near a river and are buried in a sand bar or an overbank flood, or are caught in a sandstorm. If the current in the river is fairly strong, even those few animals that die in the water are soon torn apart and their bones scattered over acres of river bottom. It is estimated that perhaps one animal in a thousand is fossilized, likely a generous estimate.

The second condition necessary for an animal to be fossilized is that it must be buried in a depositional area: that is, more and more layers of mud or gravel must be laid down over it. If the area is subject to erosion—and nearly all land surfaces are—the fossil will soon be washed out and destroyed.

The third step is that this depositional area must at some time become an erosional area, so that wind and water wear it down and uncover the buried remains.

The fourth step necessary for the recovery of a fossil is that when the fossil is uncovered, someone knowledgeable has to walk along that ridge, or study the face of that cliff, and locate the fossil and recover it. The time frame for this recovery varies, but it is always short. The fossil is protected until it is exposed, but it also is invisible. As soon as it is exposed, wind and water attack it, and they can destroy it quickly. The best fossils are found when someone spots an exposed bone that turns out to be part of a buried skeleton, and therefore still well preserved. But many fine fossils have been washed away because no one happened to see them when they were first exposed, or the people who saw them didn't realize what they were seeing.

And as if that were not enough, even the processes of evolution contribute to the lack of transitional fossils the creationists love to cite. Evolutionary changes tend to occur in small, isolated communities, and the new animals then move into the general territory and supplant their relatives there.

Figure 1. Extent of the Morrison Formation.

The transition seems to be abrupt everywhere except the small area where the change occurred. And we seldom are lucky enough to find those small areas where the changes occurred, even if they were fossilized.

Geologists call a distinctive body of rock that serves as a convenient unit for study and mapping a "formation," and name it for some spot where it is exposed. The problems and rewards of the fossil record are well illustrated by the Morrison Formation, named for a small town in the Front Range just west of Denver where it crops out. It was formed in the late Jurassic period, around 150,000,000 years ago, in the Morrison Basin, a vast subtropical area that extended from central New Mexico north to Saskatchewan. It covered about 750,000 square miles, including northeastern Arizona, eastern Utah, Colorado, northwestern Kansas, western Nebraska, Wyoming, most of Montana and more that half of North and South Dakota, plus small corners of Texas, Oklahoma, Idaho, Manitoba, and Alberta (see Figure 1). It was a hot, humid area of meandering streams and tangled forests, with seasonal dry spells. It was a dinosaur paradise.

When the first dinosaur fossil hunters came west in the

David A. Thomas is a professional sculptor, and has produced detailed scientific sculptures of dinosaurs and other ancient life forms for museums all over the world. He is an avid fossil enthusiast. He described his study of a Paluxy River trackway showing a theropod attack on a sauropod dinosaur in a feature article in the December 1997 Scientific American. *Address: Alcazar Corporation, 3205 Alcazar NE, Albuquerque, NM 87110.*

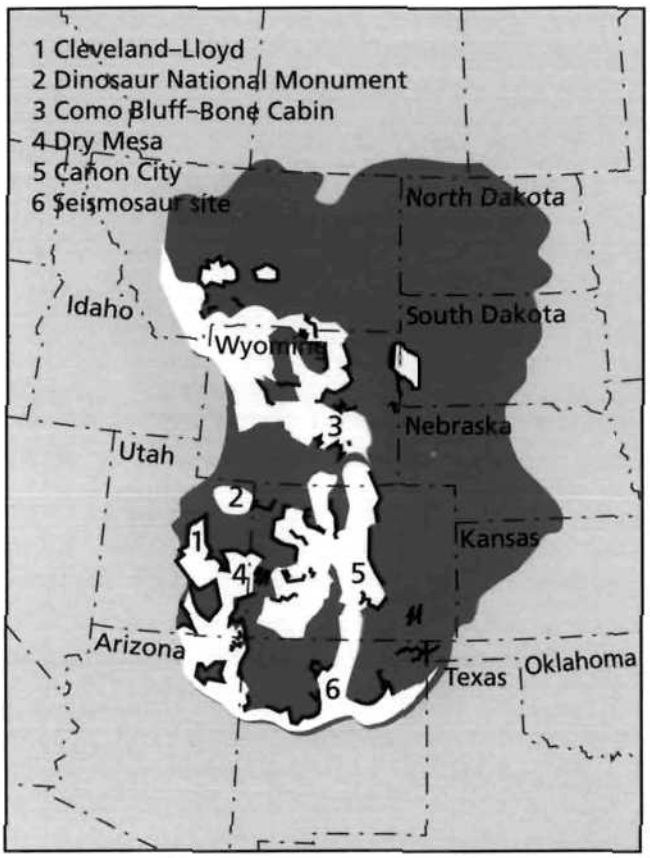


Figure 2. Sites and deposits of the Morrison Formation.

1870s, many of the great deposits they found were in the Morrison Formation. Cañon City, Colorado, and Como Bluff and Bone Cabin, Wyoming, were among the early quarries that produced wonders people had never seen before: huge sauropods including the camarasaurs, apatosaurs and long diplodocuses, and the gigantic brachiosaurs; strange stegosaurs with their double row of plates down their backs, and the carnivores that preyed on them, allosaurs and ceratosaurs. Later sites of finds include Dinosaur National Monument, Utah, where many corpses piled up on a sandbar in a sluggish river, and the Cleveland-Lloyd quarry in central Utah. This was a predator trap where five or six huge sauropods got stuck in a mud hole, drawing hundreds of carnivores, which in turn got stuck in the mud and added to the carrion smell, which drew more carnivores.

More recent finds in the Morrison Formation include the Dry Mesa quarry in western Colorado, which produced the super giants ultrasaurus and supersaurus, and the seismosaur site in New Mexico, where much of a diplodocus-related animal up to 140 feet long was lodged on a sandbar.

What a productive stratum! It has given us a large part of what we know about the late Jurassic plants and animals.

But nearly all of the eastern half of the Morrison Formation is still buried under the prairies of the high plains. Most of the quarries are west of the Front Range in Colorado, and the Rocky Mountain uplift has destroyed much of the Morrison. It has been stripped off of the Colorado mountains, the San Rafael Swell in Utah, and many other areas including the Black Hills. The Colorado River has washed it away in the canyonlands of Utah and northern Arizona. The Rio Grande rift has cut a swath through it. Volcanic action in the Yellowstone area has destroyed it in that region.

The present-day map of the Morrison Formation (Figure 2), reveals that about 75 percent of it is still buried, and nearly all of the rest is washed out and destroyed. That portion of the Morrison Formation available to paleontologists—the part that has produced the wonders described above—appears to be about one percent of the total formation, perhaps less.

But those pieces we do have of this Morrison puzzle form a coherent whole. Of course parts are missing, but just as the public library's collection of books is incomplete but still gives a good picture of modern civilization, so too do those parts of the Morrison formation corroborate and extend each other to give a good broad overview of life at that time and place. Camarasaurs and allosaurs are found in all areas. The Cleveland-Lloyd quarry gave us new carnivores, like stokesosaur and marshosaur, to go with the allosaurs and ceratosaurs. Dry Mesa gave us another big predator, torvosaur. And the finds are continuing: workers at Dinosaur National Monument in recent years turned up a nearly complete theropod (unfortunately missing the head) they have been calling "not an allosaur," which had a furcula, like a bird's wishbone, intact in the skeleton. Paleontologists in Cañon City are preparing a beautifully preserved and nearly complete skeleton of a stegosaur. Utah workers are excavating a camarasaur at Mussentuchit Wash, southwest of the San Rafael Swell.

We are never going to have a complete picture of Morrison life. We're not going to strip thousands of feet of overburden off the high plains! But we don't have to do that to have a good, broad understanding of what life was like in Morrison time. Since the quarries are in different levels of the Morrison Formation, representing different parts of Morrison time, we even have a good grasp for the way the animals evolved through time.

And that understanding is more real, more valuable and much more profound than anything the creationists could ever acquire with their all-or-nothing insistence on some impossible ideal world.

It's not true that, "If we don't know everything, we don't know anything!" We know a lot about the Morrison Formation and the thousands of formations that make up this wonderful world. We are missing some details, but the broad outlines are clear. And new finds are adding to our knowledge every day. That's where the fun is; that's what keeps the fossil hunters wandering the ridges looking for those little telltale scraps of bone.

The creationists' emphasis on the gaps of the fossil record is just another example of the nit-picking they do to try to cover their lack of evidence. They do not share science's commitment to a free and open search for truth. Since they have no facts to present, creationists are reduced to searching for debater's tricks to try to shore up their arguments, including the absurdity that evidence against "evolution"—that is, against biology and geology—is somehow evidence for their position. In so doing, they miss the reality, and the drama and excitement and fun, of the history of life on this fantastic planet. □

In 1983, Derek Freeman published Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth, *a book-length critique of the late Margaret Mead's* Coming of Age in Samoa. *Freeman, an emeritus professor at the Australian National University, had done considerable fieldwork in Samoa and weighed in on Mead's work with great authority. His critique of Mead was picked up in the popular media, and, almost overnight, the Mead-Freeman controversy was born. The title of Freeman's book conveyed his belief that Mead's Samoa was a myth, and her book a deceptively bad piece of research authored by a young anthropologist who did a minimum of real fieldwork, had little understanding of Samoan culture, and naïvely believed Samoan lies about their private lives. Was Mead, one of anthropology's great pioneers, duped into thinking that Samoa was a sexual paradise when, according to Freeman, it was a sexually repressive society?*

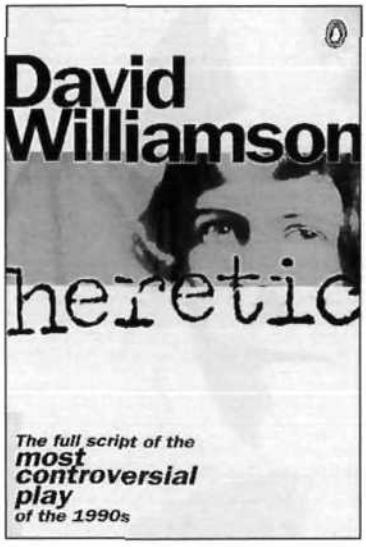
The response to Freeman's attack on Mead's work was immediate. Anthropologists for the most part were critical. Unfortunately, the public has heard mostly Freeman's side of the controversy, and many people find his argument believable. Freeman has responded to his critics within anthropology with harsh words, and now he has a new book allegedly demonstrating that Mead was "hoaxed" by Samoans. As recently as 1997 Freeman published an article on his view of the controversy. However, in this issue of the SKEPTICAL INQUIRER *scholars James E. Côté and Paul Shankman make a strong case that Freeman's argument against Mead is deeply flawed and that the public, and even respectable journals, have been taken in.*

Much Ado About Nothing
The 'Fateful Hoaxing' of Margaret Mead

Derek Freeman's polemical arguments about Margaret Mead's Samoan research fail to stand up to tests of evidence based on examination of Mead's book, her field notes, and her correspondence. His claimed "smoking gun" is itself a misrepresentation based on selective quotation and omission.

JAMES E. CÔTÉ

Derek Freeman wants the world to believe that Margaret Mead was "fatefully hoaxed" about the sexual behavior of Samoan adolescents. He also wants people to think that this purported hoaxing is of tremendous significance to the history of ideas. The link, in his mind, is that Mead's book *Coming of Age in Samoa* (1928) was based on this hoaxing, and that it subsequently had a profound influence on the way people throughout the twentieth century have thought about human behavior.



In his efforts to convey these ideas, Freeman has managed to: have his say in a documentary film (Heimans 1988); get a play written and performed about his life titled *Heretic: Based on the Life of Derek Freeman* (see Williamson 1996); present his "story" to academic colleagues on numerous occasions (e.g., Freeman 1989, 1991a, 1991b, 1992, 1997); and convince someone to publish an entire book on the matter (Freeman 1998). He has also been successful in gulling many intelligent people about the validity of his "story," including Martin Gardner (1993, 131) who reported in SKEPTICAL INQUIRER that Freeman had "irrefutable evidence" that Mead was "the gullible victim of a playful hoax." Unfortunately, Gardner based his report entirely on Freeman's version of events, and was apparently unaware of the notorious unreliability of Freeman's representation of the work of others.

Freeman's first book claiming to refute Mead's Samoan research created a great stir when it came out in 1983, but has been dismissed in numerous scholarly examinations (see Côté 1994 for a review). Not finding acceptance or adulation in the scholarly community, Freeman has gone to extraordinary lengths to present his complaint with Mead to the general public. He has managed, through years of work, to weave together miscellaneous details—some accurate, some not, and others exaggerated—into an easily conveyed melodramatic plot.

His story is much simpler than the truth, though, which gives him an advantage over those scholars who attempt to fully represent Mead's research in Samoa. In fact, the simplistic storyline he has managed to concoct provides the basis of the play about his life now running in Australia and New Zealand. As Monaghan (1996, 8) argues in a *Lingua Franca* review, this play "appears to have been culled largely from the Movie-of-the-Week playbook." But, forget the play, the plot contrived by Freeman in his ostensibly academic version of events has all the elements of a made-for-TV movie: a hero and villains, a conspiracy, deception, a smoking gun, and a motive and opportunity.

James Côté is an associate professor of sociology at the University of Western Ontario, London, Ontario N6A 5C2, and is an expert on adolescence. He is the author of Adolescent Storm and Stress: An Evaluation of the Mead-Freeman Controversy *(1994), and coauthor of* Generation on Hold: Coming of Age in the Late Twentieth Century *(1996).*

I am an academic who has been attempting to accurately represent the complexity of Mead's research in Samoa (Côté 1992, 1994, 1995). Although I am somewhat handicapped by the necessary brevity of the present article, I hope to provide enough factual information for readers to judge for themselves the accuracy of Freeman's construction of events surrounding Mead's research in Samoa.

The Plot

A Hero and Villains

Throughout the Mead-Freeman controversy, as it is called, Freeman portrayed himself as a hero who is simply searching for truth in a world of dogmatists, ideologues, and Philistines. The villains include Margaret Mead (who is portrayed as a sycophant of Franz Boas), Franz Boas (who is portrayed as a dogmatist insisting on exclusively cultural explanations of human behavior), and the social anthropology establishment (which is portrayed as consumed by a "cult of culture"). In Freeman's world, these villains are not malicious; rather, they are "cognitively deluded," as he likes to put it.

A Conspiracy

In his iterative renditions of this plot, Freeman has woven together disparate events, linking conversations from one day in 1926 with the shaping of intellectual history for the remainder of the century. This is true melodrama indeed! One of Freeman's practiced accounts of this intrigue is worth citing in detail, if only for the sense of importance he ascribes to his "find." The following is from the most recent version of his "paradigms in collision" essay (the latest subtitle is "Margaret Mead's mistake and what it has done to anthropology"):

> We are here dealing with one of the most spectacular events of the intellectual history of the 20th century. Margaret Mead, as we know (sic), was grossly hoaxed by her Samoan informants, and Mead in her turn, by convincing others of the 'genuineness' of her account of Samoa, completely misinformed, and misled virtually the entire anthropological establishment, as well as the intelligentsia at large. . . . That a Polynesian prank should have produced such a result in centers of higher learning throughout the Western world is deeply comic. But behind the comedy there is a chastening reality. It is now apparent that for decade after decade in countless textbooks, and in university and college lecture rooms throughout the Western world, students were misinformed about an issue of fundamental importance, by professors who by placing credence in Mead's conclusion of 1928 had themselves become cognitively deluded. Never can giggly fibs have had such far-reaching consequences in the groves of Academe. (1997, 68)

Sex and Deception

The stir created by Freeman's 1983 book, *Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth,* lasted for several years. Serious scholars had been aware for years

of the limitations of Mead's book,[1] but few endorsed Freeman's polemic on Mead, or his skewed reconstruction of how she supposedly shaped twentieth century social anthropology and intellectual history (Côté 1994). Not one to be daunted, though, Freeman has capitalized on the opprobrium of his critics, claiming victim status as a "heretic" who is ahead of his time (Freeman 1992, 1997). The strategy of claiming victim status at the hands of a dogmatic anthropology community has generated considerable support from a public that is unaware of the complexities of the controversy. His support is mainly from Australia, however, where it has been recently fuelled by the play about him showing there. More than one Australian colleague has told me that his cause strikes a chord with the longstanding anti-Americanism among some Australians, whereby he is seen by some as a brave Aussie standing up to bullying Yanks.

It appeared that the controversy would die out in academia until Freeman announced in the late 1980s that he had "crucially important new evidence" that resolved the controversy (Freeman 1989, 1017). This evidence, not coincidentally, also promised to rescue his failed attempt to convince fellow anthropologists that they should take a similarly scornful view of Mead's work in Samoa, and consign her work to "the trash cans of human error" (Freeman 1992, 23). What he referred to were statements made by Fa'apua'a Fa'amu, an elderly woman who had been one of Mead's age-mate Samoan friends during her 1925–1926 study. These statements have become the key issue in the controversy as it has dragged on into the 1990s.

Freeman (1996) presented the following scenario, hinging upon Fa'apua'a's statements, to the Australian public in a magazine article titled "False Paradise." According to Freeman's reconstruction of events, on Saturday, March 13, 1926, Margaret Mead was hoaxed by Fa'apua'a and a friend, Fofoa, when they were "on an outing" together. Conversations from this day, according to Freeman, led Mead to believe that she had discovered a free love society where the community did not attempt to curb the sexual activity of adolescents. Giving tremendous significance to the events of that day, Freeman specifically claims that "having been comprehensively hoaxed, she relied on what she had been told by Fofoa and Fa'apua'a, and *made this the information on which she based* her best-selling *Coming of Age in Samoa*" (emphasis added).

It is not quite clear exactly what Freeman would have us believe here. Certainly he cannot want us to believe that Mead's 297-page book is based on one day of conversation with two people, including Fa'apua'a. The ludicrous nature of this claim can be evaluated by simply reviewing Mead's book. Particular attention should be paid to the five detailed Appendices, especially Appendix V in which the results of her personal interviews are tabulated. When this is done, it is clear that she provided extensive details about her twenty-five adolescent informants and many others. Surely, Freeman cannot expect anyone who can read to believe that this highly detailed information was collected on one day.

When we look more deeply into Mead's book, we find a mass of information about dozens of people and little about a character resembling Fa'apua'a. However, if Freeman's claim about the hoaxing is correct, we should find references to a character resembling Fa'apua'a throughout Mead's fieldnotes and book.[2] But we do not. So, even if information about, or obtained from, Fa'apua'a made it into the book and is false, Fa'apua'a's current recanting has little bearing on the other material in Mead's book.

His story is much simpler than the truth, which gives him an advantage over those scholars who attempt to fully represent Mead's research in Samoa.

The spuriousness of Freeman's argument is clearly evident when we compare the information that Freeman alleges Mead obtained from Fa'apua'a with what Mead actually wrote in her fieldnotes and book. The following, taken from the film *Margaret Mead and Samoa*, is what the elderly Fa'apua'a claimed in 1987 to have said sixty-one years earlier to Mead in 1926:

> *Galea'i Poumele:* Did she ever ask what you did at nights?
> *Fa'apua'a:* Yes, she asked us what we did after dark. We girls would pinch each other and tell her that we were out with the boys. We were only joking but she took it seriously. As you know Samoan girls are terrific liars and love making fun of people but Margaret thought it was all true. [In another account of this same interview, Freeman (1989) cites her as saying "We spend the night with boys"]
> *Galea'i Poumele:* So you answered Margaret Mead with lies?
> *Fa'apua'a:* Yes, we just lied and lied.

In evaluating the possible link between these statements by Fa'apua'a and the contents of *Coming of Age in Samoa,* we can first consult Mead's fieldnotes. Martin Orans (1996) has carefully examined these and her correspondence with Franz Boas. On the basis of this evidence, he concludes several things about the unlikeliness of Freeman's argument. For example, Orans argues that "not only was Fa'apua'a unlikely to have been Mead's principal informant, as Freeman reports, but she appears to have been regarded by Mead as no kind of informant; for there is not a single bit of information in the field materials attributed to Fa'apua'a" (152). In addition, Orans found in these fieldnotes that "the alleged testimony of Fa'apua'a hardly compares in detail, never mind seriousness, with the evidence that Mead compiled from acknowledged informants including the adolescent girls themselves" (152).

In evaluating the relevance of Fa'apua'a's statements for Mead's book, we can also examine the book itself. If *Coming of Age in Samoa* is based on what Fa'apua'a said to Mead, where is this character in the book? Based on my many readings of

the book, I found only two people who come even close to matching Fa'apua'a's identity. These are characters Mead called Manita and Pana. However, the description of Manita comprises less than one page of text spread over pages 166 and 167 and that of Pana only a few descriptive sentences on page 52. From his reading of the fieldnotes, Orans has concluded that Fa'apua'a is Pana, but he found no reference to a Manita (personal communication, April 16, 1998). It is possible that Mead split Fa'apua'a into the two characters in an attempt to disguise Fa'apua'a's identity, but this would still amount to only about a page of text about Fa'apua'a. In short, had Mead based the book on what she was told by Fa'apua'a, Fa'apua'a would have figured prominently in the fieldnotes and as a character in the book, and she does not.

Freeman could perhaps present a more convincing argument if he claimed only that Fa'apua'a influenced the direction Mead took her book, leading her to depict a free love society in general. However, this argument fails several tests of logic.

First, Mead could not have gone into the field unaware of the reports of Polynesian sexual practices that date back to Cook. For example, while on her way to Samoa she stopped at the Bishop Museum in Honolulu from August 11 to 24, 1925. During that visit she met with officials of the museum who "did their utmost to persuade her to undertake ethnological research in Samoa on behalf of the Bishop museum" (Freeman 1996, 9). They were very helpful in preparing Mead for her research. This is indicated in a letter to Boas of August 29, 1925, including a note that while there she "went through the literature on Samoa which [she] had not seen." On the issue of whether Fa'apua'a might have misled Mead into portraying Samoan society as one of free love, then, it is highly unlikely that Mead needed Fa'apua'a to introduce her to such ideas, because evidence of sexual promiscuity can be found in many of the early writings on Polynesia in general, and Samoa in particular (Côté 1994). Mead was not the first to capitalize on Western sexual stereotypes about Polynesians, and she certainly would not have needed Fa'apua'a to introduce her to these.

But Freeman's notion that Mead's book is some sort of a handbook for a free-love society based on Fa'apua'a's fibs fails the test of scrutiny (this is a crucial scene in the play about Freeman that suggests why he decided to begin his life-long crusade against Mead). In *Coming of Age* we find extensive references to restrictions on adolescent sexual behavior, particularly by the family. Readers can check this for themselves, and they can consult Orans (1996) with respect to her fieldnotes. Mead was aware of, and wrote about these restrictions. Although Mead did provide misleading embellishments when it came to writing the book for the general public,[5] anyone who has read her book knows that she did not describe a free love society and her book is not some sort of free love manual. The type of first-hand knowledge gained from actually reading Mead is lost on those who rely only on Freeman's account. Orans (99) draws a similar conclusion:

> When one compares the data on sexuality that Mead had collected from sources other than Fa'apua'a and Fofoa with the paltry data to which Fa'apua'a testifies, it is evident that such *humorous fibbing could not be the basis of Mead's understanding.* Freeman asks us to imagine that the joking of two women, pinching each other as they put Mead on about their sexuality and that of adolescents, was of more significance than the detailed information she had collected throughout her fieldwork.

And finally, in an attempt to create high drama, Freeman put all of his eggs in one basket by claiming that the hoaxing took place on one day (March 13, 1925). What Freeman is remiss in reporting, though, is that during subsequent interviews with Fa'apua'a, evidence of a sudden hoaxing vanished. In May of 1993, for example, she told a follow-up interviewer that "the hoaxing occurred over a long period of time" (Orans, 1996, citing *The Samoa Times,* May 21, 1993).

From every angle considered, Freeman's attempt to use Fa'apua'a as a foil to foment controversy and resolve it in his favor fails decisively. The only plot that thickens concerns his motivations to misrepresent and conceal reality. This plot may not have sex, but it appears to have deception.

The Smoking Gun

Freeman must have realized that the vague recollections of an elderly woman who swears on a bible that she is a liar lack credibility. In his search for better evidence, he eventually reviewed Mead's fieldnotes and personal letters. From among the letters Mead wrote to Boas, he claims to have found the "smoking gun." This "hard evidence" is from a letter written by Mead to Franz Boas on March 14, 1926, the day after the supposed "fateful hoaxing" took place. According to Freeman, "she wrote elatedly to Boas describing Samoa . . . as a place where 'the community' did not attempt to 'curb' the sexual activity of adolescence" (1996, 9).

Fortunately, Freeman is not the only one with access to these letters. Orans (1996, 96–97) has also examined this letter (and other letters between Mead and Boas), to discover that Freeman has seriously distorted its contents. The truth is that Mead wrote something quite different in that letter. Four sentences before the line Freeman cites, she wrote that it is "the family and not the community (except in the case of the taupou) which attempts to preserve a girl's virginity and this attempt is usually secretly frustrated rather than openly combatted by the adolescent." In the sentence that Freeman cites, Mead actually wrote that when the community recognizes the stress caused if it interferes with adolescent sexual behavior, "and does not attempt to curb it there is no conflict at all between the adolescent and the community." In other words, Mead wrote to Boas saying that the Samoan *family,* not the community, curbed female adolescent behavior, except in the case of *taupou* (who are the ceremonial virgins representing the village). Freeman cites only the part about the community not curbing sexual behavior, making it sound like she was telling

Boas there were no restraints at all. Freeman portrays Mead as claiming that she found a free love society, when in fact she was reporting that adolescents do not encounter conflict with the community when people stay out of their personal lives.

I am also in possession of these letters and I can verify that Orans' citation is accurate and complete. Freeman's selective account, however, is a gross misrepresentation of the letter's content. Freeman ought to know what the truth is, for the following reasons: (a) he has claimed throughout the controversy that he is a meticulous scholar and this is not something that can be easily missed; (b) he knows that Orans has pointed out the true contents of the letter because he read a prepublication draft of Orans' book (Orans 1996, vii); and (c) he is in possession of a copy of the letter himself. Yet, Freeman continues to misrepresent Mead on this matter. Is this an oversight or fraud? Whatever it is, there is no "smoking gun." However, there does appear to be misrepresented evidence proffered by Freeman that constitutes a form of academic perjury in its published form.

The Motive and Opportunity

A good detective story would not be complete without a well-rounded plot. To put flesh on the bones of his plot, Freeman ascribes a motive to Mead for being so ready to accept the "giggly fibs" of Fa'apua'a and Fofoa. Freeman claims that several months into her study Mead was delinquent in undertaking her investigation of "the sexual life of the adolescent girl." In his view, this was in part because a hurricane hit the villages she was studying and in part because she was collecting ethnographic information for the Bishop Museum of Honolulu. Freeman claims that the collection of ethnographic data was done against Boas' wishes, and that this put Mead's "study of heredity and environment in relation to the adolescent . . . in a state of acute crisis" (Freeman 1996, 9).

With this purported motive, Freeman has seized upon the following events as a concoction of Mead's opportunity to commit the intellectual crime of the century. Freeman frames this as follows: "It was this parlous situation, with very little time left to her in Samoa, that Mead turned to insistently questioning Fofoa and Fa'apua'a about the sexual behavior of Samoan girls and young women. . . . As Fa'apua'a confessed it was during this time that, as a prank, she and Fofoa told their American inquisitor the very antithesis of the truth" (Freeman 1996, 9).

Freeman would have us believe that Mead was in such a panic to present findings that would please Boas that she desperately believed some "giggly fibs" about spending nights with boys. However, as we saw above, Freeman is remiss in reporting that upon further questioning Fa'apua'a thought that "the hoaxing occurred over a long period of time." This revelation devastates Freeman's theory of opportunity.

As for motive, we can turn to Orans' book to see how poorly Freeman's gumshoe account accords with the actual content of Mead's fieldnotes and letters, which provide a log for her investigations. Orans (1996, 97–99) lays these events out quite clearly. He begins by noting that Mead had in fact been working for some time on the aspect of her study dealing with sexual behavior. One account was based on five weeks of detailed work. In a letter of January 6, 1926, she reported a conclusion similar to the March 14 letter.[4] This was two months before the supposed "fateful hoaxing." And again on February 15, one month before the alleged hoaxing, we find her discussing sexual matters in a letter to Boas. Orans concluded from his examination of these primary sources that "Mead's conclusions regarding sexuality were changed in no way by the alleged fibbing of Fa'apua'a and Fofoa."

Freeman's evidence that Mead planned to undertake "a special investigation of sexual behavior," but did not undertake it, is from a letter she wrote to Boas on February 15. However, once again, Freeman is selective in his citation of a source because Mead also wrote in this letter that "and of course I have a good deal of material on both subjects already," referring to her respondents' sexual lives and philosophical conflicts. Thus, Mead was intending to complete these investigations, not begin them as Freeman would have us believe. Freeman also omits the portion of Mead's February 15 letter that states: "I have been taking stock of the amount of material which I have accumulated and I think I can report that my work is going nicely." Indeed, Orans found evidence in Mead's fieldnotes that her "inquiries on adolescent sexuality continued after February 15." So much for motive.

From every angle considered, Freeman's attempt to use Fa'apua'a as a foil to foment controversy and resolve it in his favor fails decisively.

Much ado about nothing . . . except perhaps Freeman's attempt to bully his way into intellectual history

With so many holes in his "fateful hoaxing" theory, just why would Freeman press the issue? Might it be that the public acclaim from the documentary film, the play, and various articles about him provide Freeman with a sufficient gratification for his efforts? And, might it be that it is the general public of the 1990s which is being hoaxed with a "discovery" that has a half-life of credibility far shorter than the "discovery" of Piltdown Man? When the facts are known, and common sense prevails in the matter, I believe the general public will realize that his "fateful hoaxing" claim is much ado about nothing, and that it is Freeman who has hoodwinked the public, not some Samoan women or Margaret Mead. I also believe that Freeman's quest to create an esteemed place for himself in the

history of ideas at the expense of his colleagues is ill-fated, and that conscientious scholars will not let his misrepresentations go uncorrected.

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Notes

1. In writing the book for the general public, Mead did simplify and overgeneralize in places, providing some misleading accounts to those who would undertake only a surface reading of the book. In her Appendix II, however, she explains the problems she faced in describing a culture in transition (see Côté, 1994, for a detailed discussion of this). It is also apparent in her correspondence with Boas that she was unsure how to provide convincing generalizations based on nonstatistical methods.

2. Mead (1972, 154) wrote that she "carefully disguised all the names, sometimes using double disguises so that the actual individuals could never be identified." While this is laudable, obvious details like someone being a *taupou* (the ceremonial virgin of a village) limit the disguise considerably, and given this is a nonfictional book, the factual elements of characters could not have been extensively fabricated. At the same time, because of her attempt to disguise characters, we should not expect a total correspondence between details of the characters in her book and the details about the lives of the people she discussed.

3. The embellishments were apparently encouraged by her publisher, who was obviously interested in selling as many of her books as possible. They can be found mainly in chapters 2, 13, and 14, which were added at her publisher's request. But even these chapters contain only a few questionable phrases that intelligent readers would identify as being targeted at the general public in an attempt to maintain their interest in the book. The issue of the book's reputation as being some sort of *Kama Sutra* of the South Seas appears to stem from the publisher's promotion of the book, and the suggestive cover designs of various editions. Mead's biographer, Jane Howard, gives us a glimpse of the events surrounding the publication of the book: "A professor in Tennessee wrote her to suggest that she expurgate her final two chapters, which, following her publisher's suggestion, connected her Samoan conclusions with her view of America. Mead replied that out of a total of 297 pages, there were exactly 68 which dealt with sex" (1984, 128).

4. And, even before meeting Fa'pua'a, Mead wrote in her November 29, 1925, report to Boas, that on "the problem of the adolescent girl," there were "two sets of ideals, one the Taupou Concept and the other the missionary one of the Good Christian Girl." She went on to note that the taupou tradition had been passing away there, but that it provided "vicarious virtue for the rest of the village" and since there was virtually no chance of the rest of the girls of the village becoming a taupou, "none of the requirements of modesty, dignity, chastity, were made on the other girls in the village." The exception to this were the girls who attempted to follow the Good Christian life and live in the household of the pastor, sometimes at the urging of their parents who wanted them "to appear virtuous." They were strictly supervised, and constituted a control group for Mead in comparison to the other girls in the community. □

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Margaret Mead, Derek Freeman, and the Issue of Evolution

Derek Freeman argues that the central issue in the Mead-Freeman controversy is evolution and that Margaret Mead was anti-evolutionary. A review of Mead's writing on evolution demonstrates that she favored an evolutionary approach throughout her career. Freeman simply omits Mead's views on evolution in his attempt to discredit her work.

PAUL SHANKMAN

After reading a recent article by Derek Freeman, I had a curious sense of déjà vu. The article was entitled "Paradigms in Collision: Margaret Mead's Mistake and What It Has Done to Anthropology" (1997), and it reminded me that Freeman had published an article with almost the same title and similar content five years earlier (1992). But then Freeman has been relentlessly criticizing the work of Margaret Mead for the past fifteen years. And he shows no signs of tiring.

One of the most interesting aspects of Freeman's critique is that a number of intelligent people have come to believe it. Initially, Freeman argued that a young, gullible Mead mistook Samoan jokes about sexual conduct for the truth, and that this alleged mistake led to the false doctrine of absolute cultural determinism, which in turn had profound

intellectual consequences. Recently, Freeman has given more attention to the issue of evolution, which he believes is at the heart of the controversy. Specifically, he holds Mead responsible for the anti-evolutionary paradigm in which only cultural variables are important and in which "all human behavior is the result of social conditioning." For Freeman, evolution has become the ultimate issue in his critique of Mead and is the central focus of "Paradigms in Collision."

Freeman rejects the "Mead paradigm" in favor of an interactionist one that recognizes biological as well as cultural variables. Freeman also deplores the dominance of the "Mead paradigm" which, due to a cult-like loyalty to her, has perpetuated a "tabula rasa anthropology" from which the discipline has yet to recover. He believes that only when anthropologists recognize Mead's initial error and its disastrous intellectual consequences will the discipline have a promising future.

If evolution is not at the heart of Freeman's critique of Mead, if indeed both Freeman and Mead hold similar views of the relationship of biology and culture, then what is the point of Freeman's "Paradigms in Collision"?

There is high drama in Freeman's account: A lone dissenter from the conventional wisdom uncovers a great anthropologist's original sin in his search for truth. Her reputation is tarnished. What ensues is an epic struggle for the soul of a discipline held hostage by the ghost of a legendary figure. Margaret Mead, symbol of American anthropology, was anti-evolutionary. What could be worse?

Unfortunately, like so much of his critique of Mead, Freeman relies on a caricature of Mead's views and her influence on anthropology. Granted that it is an entertaining caricature full of implications about Freeman's own place in intellectual history. Yet a closer look at this argument demonstrates that on the fundamental issues of biology, culture, and evolution, Mead and Freeman are in substantial agreement. Mead was not anti-evolutionary; she held what are now conventional views on evolution, just like Freeman. So there are no "paradigms in collision." Freeman has simply omitted much of what Mead actually wrote on evolution. In this article, Freeman's and Mead's views on biology, culture, and evolution are reviewed. Freeman's misrepresentation of Mead's views raises questions about his scholarship, which is now the real issue in this long-running "controversy."

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Mead's View of Biology, Culture, and Evolution

Mead's views on the interaction of biology and culture were complex, not simplistic, and developed over her long career. Early on, she emphasized the importance of culture, stating that differences between cultures arose from a common biological basis. This was the crux of *Coming of Age in Samoa* (1928), in which Mead argued that adolescence was a universal biological process, but that there were differences in the way that this process was handled by different cultures. Cultural differences arose from a common biological basis, yet they could not be explained by biology alone. These differences suggested to Mead that there was no single way to manage adolescence. Americans could therefore make choices about handling this stage in the human life cycle.

In her early work, Mead did argue that human nature was extremely malleable. However, as historian Carl Degler (1991) found in his comprehensive review of Darwinian thought in the twentieth century, Mead's views on human nature developed over four decades during which the political and intellectual climate was changing. Thus, when she argued against racial and biological explanations, she emphasized culture; when she was discussing sex roles, biology received more attention. For example, in *Male and Female* (1949), Mead discussed the significance of biological differences in sex roles and sexuality.

Far from naïvely embracing the *"tabula rasa"* point of view, Mead specifically pointed out its weaknesses in the 1940s (1942, 1947), while noting the importance of the interaction of biology and culture in the human maturation process. Furthermore, in her presidential address to the American Anthropological Association in 1960, Mead stated that genetics is "enormously relevant to problems absolutely central to our discipline" and was concerned that research on genetics had been largely confined to physical anthropology (1961, 480). She also urged her colleagues to take advantage of "the opportunity provided by the new upsurge of interest in the whole field of evolution, in which human evolution is one part and cultural evolution a smaller one" (1961, 481). And she reminded anthropologists that Theodosius Dobzhansky, George Gaylord Simpson, and other natural scientists were interested in communicating with them about evolution (1961, 481). Given such public statements, can anyone take seriously Freeman's assertion that Mead believed that "all human behavior is the result of social conditioning" or that she was anti-evolutionary? Of course not. Freeman has simply neglected those parts of Mead's work that do not support his current views.

Freeman's View of Biology, Culture, and Evolution

Freeman's views are, in fact, very similar to Mead's. He often emphasizes the importance of culture. Like Mead, Freeman believes that since humans can learn non-genetically and transmit information symbolically, culture often gives meaning to behavior. He notes that people may attribute different cultural meanings to the same genetically prescribed behaviors. As an example, he cites the genetically prescribed behavior known as the eyebrow flash which means 'yes' in Samoa while meaning 'no' in Greece. According to Freeman, "It is the existence of such conventional behaviors, in great profusion, in all human populations, that establishes, indubitably, the *autonomy of culture*" (1980, 215; my emphasis).

On the issue of choice, Freeman is as much a cultural determinist as Mead. He states that "because cultural phenomena are particular alternatives, created by human agency in the course of history, it is always possible for these alternatives to be rapidly, and even radically changed . . . [T]he choice of new alternatives, is, in many instances, not connected in any significant way with the process of genetic evolution, or, for that matter, with human physiology" (1980, 215). He concludes that humans, "with their biologically given and culturally nurtured capacity for alternative action, cannot be said to have any kind of 'ultimate' nature" (1981, 99–100).

Evolution

In "Paradigms in Collision, " Freeman stresses our primate heritage, our evolutionary history, and the emergence of culture as a biologically based means of allowing choices to be made and transmitted through non-genetic mechanisms. This view of culture, based on a common biological heritage, is one he shares with Mead. She stated that "Cultural systems will be treated as extensions of the power to learn, store, and transmit information, and the evolution of culture as dependent upon biological developments of these abilities and the cultural developments that actualize them" (1964, 31).

The emphasis on cultural variables at one point in time and biological variables at another may give the appearance of the existence of two very different paradigms, but Freeman seems to have no problem embracing the "autonomy of culture" when criticizing sociobiology (1980), while invoking evolution in his critique of Mead (1997). For Mead, this was a matter of emphasis, not one of irreconcilable differences. In her book *Continuities in Cultural Evolution* she stated that:

> At some points in the history of anthropology it has been important to stress the discontinuity between man as a culture-building animal and all other living creatures. It has also been important to stress that man is a mammal with certain types of behavior appropriate to mammals and to identify these behaviors which can be recognized as related between monkeys, apes, and man (1964, 25).

Mead, along with most anthropologists, would no doubt have agreed with Freeman when he asserts that "humans, like our chimpanzee cousins, far from being empty tablets at birth, are born with a phylogenetically given primate nature, components of which remain with us throughout our lives beneath all of the conventional behaviors that we acquire by learning from other members of the society to which we belong" (1997, 70).

Margaret Mead's work in cultural anthropology in the 1920s exploring the effect of culture on the behavior and personalities of children and adults is honored in this 1998 U.S. postage stamp, part of the U.S. Postal Service's "Celebrate the Century" series.

Interactionism

What of the modern interactionist paradigm that Freeman advocates? Freeman believes in a view of human evolution in which the genetic and exogenetic (i.e., cultural) are distinct but interacting parts of a single system (1983, 299) and that genetic factors combine with environmental factors to influence behavioral differences among individuals (1997, 71). Mead anticipated this position in 1935 when discussing the role of innate temperament and its interaction with culture. In *Behavior and Evolution,* edited by Anne Roe and George Gaylord Simpson, she stated that "We can get some picture of how change occurs only when each individual is fully specified in his genetic and experiential peculiarity . . . " (1958, 496).

Given Mead's interactionist views of the relationship of biology and culture, and her interest in evolution, articulated *long before* Freeman developed his current views on these subjects, one might expect Freeman to review and discuss Mead's actual positions as they developed over her fifty-year career, especially since he is willing to discuss how his own views have changed over the course of his career. Yet Freeman cites Mead selectively and omits mention of her interest in evolution. He does not even pretend to review Mead's work on this subject.

This omission raises an important question. If evolution is not at the heart of Freeman's critique of Mead, if indeed both Freeman and Mead hold similar views of the relationship of biology and culture, then what is the point of Freeman's "Paradigms in Collision"? Freeman attempts to enlist the legitimacy of evolution and interactionism as a weapon in his effort to cast doubt on the work of Mead, but there are no "paradigms in collision."[2] Indeed, the so-called central issue in Freeman's critique is not an issue at all.

By misrepresenting Mead's views and by presenting himself as the guardian of evolution and interactionism, Freeman asks his readers to dismiss Mead's work as mistaken, misguided, and anachronistic, and accept Freeman's position as accurate, responsible, and thoroughly scientific. The choice, however, is

Margaret Mead during her studies in Samoa. (Corbis-Bettmann)

not between Mead on the one hand and Freeman on the other. It is between wondering whether Freeman has read what Mead said and, for whatever reasons, omitted passages that do not support his argument, or whether he did not carefully read Mead and therefore is not fully aware of what she has written. *Neither of these choices reflects well on Freeman's scholarship.*

The World View of Derek Freeman

Freeman's own discovery of evolution's importance came rather late, in the 1960s. And there is little that is new or original in Freeman's discussion of the worthwhile topics of evolution and interactionism. Evolution is part of most general textbooks in anthropology in the U.S., despite Freeman's insistence on the negative influence of the so-called "Mead paradigm." Nevertheless, Freeman portrays himself as a victim in the lonely struggle for truth. He sees himself as the voice of reason among "irrational" anthropologists following the "prescientific ideology" of a "totemic mother." Freeman even asserts that a top professional journal, the *American Anthropologist,* has suppressed his work in "the interests of a ruling ideology" (1997, 73). He does not mention that this same journal has published more exchanges on his critique of Mead than any other. This fact is irrelevant: the rhetoric has served its purpose.

The general approach that Freeman has employed to promote his argument and himself was described in broad terms by anthropologist Marshall Sahlins (1979) well before the Mead/Freeman controversy existed. At the outset, Sahlins comments, Professor X publishes a theory despite evidence to the contrary. When scholars familiar with the evidence question Professor X's work, he denounces them in "the highest moral tones" and engages in attacks on them personally. The battle lines are drawn, and he has now become "the controversial Professor X." His ideas are discussed seriously by nonprofessionals, especially journalists. Soon he has become a familiar figure in the media where nonprofessionals have difficulty challenging him and demonstrating the weaknesses in his argument. It is through this process that Professor X, like Freeman, has gained popular respectability.

With each new version of his critique of Mead, Freeman has escalated the rhetoric and his importance in this self-made controversy. What began fifteen years ago as a critique of the "Boasian paradigm" has become a critique of the "Mead paradigm." Mead's alleged "mistake" in Samoa has become her "fateful hoaxing." Freeman himself has gone from a critic of Mead to a self-styled "heretic" in pursuit of truth against the conventional wisdom of a discipline. The title of a new edition of *Margaret Mead and Samoa* (1983) released in Australia reflects Freeman's increasing sense of stature in relation to Mead; it is now *Margaret Mead and the Heretic* (1996). And the title of Freeman's recent article, "Paradigms in Collision," implies near-mythic proportions of Freeman's critique.

Yet *Coming of Age in Samoa* was not the intellectual disaster of momentous consequence that Freeman believes. The book posed important questions for the general public at the time it was written in 1928 and for about four decades thereafter. That is why it became a popular classic, not because it is a model for professional scholarship today. *Coming of Age in Samoa* was never a sacred text for most anthropologists. Although Mead and *Coming of Age in Samoa* were enormously popular with the general public, within the profession neither she nor her book led generations of anthropologists to embrace the so-called "Mead paradigm." Her very popularity led academic anthropologists to treat her work with caution, recognizing its limitations as well as its strengths. Like so much of the anthropology from the early part of the century, ideas proposed by Mead in the 1920s, 1930s, and 1940s were later

criticized, modified, and revised. Thus Mead is not the central theoretical figure in anthropology that Freeman suggests, although she did make a number of important contributions.

No wonder that most professional anthropologists have lost interest in Freeman's argument. His critique of Mead and his history of the discipline are deeply flawed. Yet the same style of argument that has turned off anthropologists has attracted the media, and intelligent people have been drawn to Freeman's appeals to truth, science, and evolution. This is unfortunate because these are not the real issues involved. The truth about the controversy is more mundane. Evolution and interactionism are old news. *Coming of Age in Samoa* was written in 1928. Mixing these ingredients together in Freeman's intellectual Cuisinart and adding words like "hoax" and "paradigm" may be enticing, but it does not make for good scholarship. By exaggerating Mead's theoretical place in academic anthropology, Freeman implicitly magnifies his own importance and neglects her real contributions. By relying so heavily on caricature, omission, and overstatement, Freeman, far from saving anthropology, has become an intellectual speedbump in the way of our understanding Samoa, the work of Margaret Mead, and the state of anthropology today.

Remembering Margaret Mead

When the dust eventually settles on this never-ending controversy, how will Mead and Freeman be remembered? Freeman will be remembered for his tireless assault on Mead, which has received widespread attention, in part because his misrepresentations are so boldly stated that relatively few people have bothered to check the historical record. But Freeman's proverbial fifteen minutes of fame will expire, and his contributions are limited.

Anthropologists will remember Mead as more than the object of Freeman's critique simply because, over the course of her long career, she did make a number of lasting contributions. Mead was a pioneer. In a span of fifteen years between 1925 and 1939, she made five field trips to the South Pacific, studied eight different cultures, and published popular and professional works on most of them. While these works are not particularly important today, they became part of the foundation on which future anthropologists built. Mead was also among the first anthropologists to focus on childhood, adolescence, and gender as important topics of research; today anthropologists approach these issues more wisely because of her work. Mead's efforts to bring teams of male and female anthropologists to the field, instead of only individuals, improved data collection and analysis. She was among the first to use still photography and film in the field. Most importantly, Mead almost single-handedly popularized anthropology for the general public, putting the discipline on the map. And, whatever her shortcomings, she did all of these things at a time when women were not expected to be professionals. It is for these reasons, and many more, that Mead deserves recognition as the pioneering figure that she was.

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Notes

1. Degler concludes that Mead's changing views on the the biological differences between men and women were a "harbinger of things to come: the emergence of the sociobiological approach to the ancient question of the nature of the sexes, and the rediscovery by a reinvigorated feminist movement of the human values of differences between men and women" (1991, 138).

Mead did become involved in the controversy over sociobiology. In his autobiography, E. O. Wilson, a founder of sociobiology, recalls that at the 1976 American Anthropological Association meetings, a motion was made to formally censure sociobiology and to cancel two symposia on the subject that had been previously scheduled. "During the debate on the matter Margaret Mead rose indignantly, great walking stick in hand, to challenge the very idea of adjudicating a theory. She condemned the motion as a 'book-burning proposal.' Soon afterward the motion was defeated—but not by an impressive margin" (1994, 331).

The following year, at a conference on human behavior, Mead invited Wilson to dinner to discuss sociobiology. He remembers, "I was nervous then, expecting America's mother figure to scold me about the nature of genetic determinism. I had nothing to fear. She wanted to stress that she, too, had published ideas on the biological basis of social behavior" (1994, 348). Thus, at the very end of her career, Mead's interest in the role of biology in human behavior was apparent.

2. There is such a cultural determinist school/social constructionist school of thought, and here there are "paradigms in collision, " but this school draws on a different intellectual ancestry than Margaret Mead (Ehrenreich and McIntosh 1997). □

The Martian Panic Sixty Years Later
What Have We Learned?

The 'War of the Worlds' panic happened sixty years ago, but its lessons are as relevant today as back then.

ROBERT E. BARTHOLOMEW

Shortly after 8 o'clock on Sunday evening, October 30, 1938, many Americans became anxious or panic-stricken after listening to a realistic live one-hour radio play depicting a fictitious Martian landing at the Wilmuth farm in the tiny hamlet of Grovers Mill, New Jersey. Those living in the immediate vicinity of the bogus invasion appeared to have been most frightened, although the broadcast could be heard in all regions of the continental United States and no one particular location was immune. The play included references to real places, buildings, highways, and streets. The broadcast also contained prestigious speakers, convincing sound effects, and realistic special bulletins. The drama was produced by a 23-year-old theatrical prodigy named George Orson Welles (1915–1985), who was accompanied by a small group of actors and musicians in a New

York City studio of the Columbia Broadcasting System's Mercury Theater. The actual broadcast script was written by Howard Koch, who loosely based it on the 1898 book *The War of the Worlds* by acclaimed science fiction writer Herbert George (H.G.) Wells (1866–1946). In the original Wells novel, the Martians had landed in nineteenth century Woking, England. Sixty years after the 1938 event, it remains arguably the most widely known delusion in United States, and perhaps world history, and many radio stations around the world continue to broadcast the original play each Halloween eve.

During this sixtieth anniversary year of the Martian panic, it is timely to reflect on the lessons we can glean from the incident, applying the wisdom that six decades of hindsight can provide.

Human Perception and Memory Reconstruction Are Remarkably Flawed

Today many people seem to forget that the Martian "invasion" illustrates far more than a short-term panic. It is a testament to the remarkable power of expectation on perception. A person's frame of reference has a strong influence on how external stimuli are interpreted and internalized as reality (Buckhout 1974). Perception is highly unreliable and subject to error (Loftus 1979; Wells and Turtle 1986; Ross, Read, and Toglia 1994). This effect has long been known to be pronounced under situations of stress, ambiguity, and uncertainty (Sherif and Harvey 1952; Asch 1956; Krech, Crutchfield, and Ballschey 1962). This message cannot be over-emphasized and continues to go widely unheeded, as visual misperceptions are a common thread in many reports of such diverse phenomena as religious signs and wonders, UFOs, and Bigfoot.

In his famous study of the Martian panic, Princeton University psychologist Hadley Cantril discusses the extreme variability of eyewitness descriptions of the "invasion." These examples have been usually overlooked in subsequent popular and scholarly discussions of the panic. One person became convinced that they could smell the poison gas and feel the heat rays as described on the radio, while another became emotionally distraught and felt a choking sensation from the imaginary "gas" (Cantril 1947, 94–95). During the broadcast several residents reported observations to police "of Martians on their giant machines poised on the Jersey Palisades" (Markush 1973, 379). After checking various descriptions of the panic, Bulgatz (1992, 129) reported that a Boston woman said she could actually see the fire as described on the radio; other persons told of hearing machine gun fire or the "swish" sound of the Martians. A man even climbed atop a Manhattan building with binoculars and described seeing "the flames of battle."

The event also reminds us that the human mind does not function like a video camera capturing each piece of data that comes into its field of vision. People interpret information as it is processed. These memories are not statically locked away in the brain forever, but our memories of events are reconstructed over time (Loftus and Ketcham, 1991). Cantril (1947) cited the case of Miss Jane Dean, a devoutly religious woman, who, when recalling the broadcast, said the most realistic portion was "the sheet of flame that swept over the entire country. That is just the way I pictured the end" (181). In reality, there was no mention of a sheet of flame anywhere in the broadcast.

The Mass Media Are a Powerful Force in Society

Not only does the Martian panic demonstrate the enormous influence of the mass media in contemporary society, but in recent years an ironic twist has developed. There is a growing consensus among sociologists that the extent of the panic, as described by Cantril, was greatly exaggerated (Miller 1985; Bainbridge 1987; Goode 1992). The irony here is that for the better part of the past sixty years many people may have been misled by the media to believe that the panic was far more extensive and intense than it apparently was. However, regardless of the extent of the panic, there is little doubt that many Americans were genuinely frightened and some did try to flee the Martian gas raids and heat rays, especially in New Jersey and New York.

Based on various opinion polls and estimates, Cantril calculated that of about 1.7 million people who heard the drama, nearly 1.2 million "were excited" to varying degrees (58). Yet there is only scant anecdotal evidence to suggest that many listeners actually took some action after hearing the broadcast, such as packing belongings, grabbing guns, or fleeing in motor vehicles. In fact, much of Cantril's study was based on interviews with just 135 people. Bainbridge (1987) is critical of Cantril for citing just a few colorful stories from a small number of people who panicked. According to Bainbridge, on any given night, out of a pool of over a million people, at least a thousand would have been driving excessively fast or engaging in rambunctious behavior. From this perspective, the event was primarily a news media creation. Miller (1985, 100) supports this view, noting that while the day after the panic many newspapers carried accounts of suicides and heart attacks by frightened citizens, they proved to have been unfounded but have passed into American folklore. Miller also takes Cantril to task for failing to show substantial evidence of mass flight from the perceived attack (1985, 106), citing just a few examples and not warranting an estimate of over one million panic-stricken Americans. While Cantril cites American Telephone Company figures indicating that local media and law enforcement agencies were inundated with up to 40 percent more telephone calls than normal in parts of New Jersey during the broadcast, he did not determine the specific nature of these calls:

> Some callers requested information, such as which units of national guard were being called up or whether casualty lists were available. Some people called to find out where they could go to donate blood. Some callers were simply angry that such a realistic show was allowed on the air, while others called CBS to congratulate Mercury Theater for the exciting Halloween program. . . . we cannot know how many of these

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> telephone calls were between households. It seems . . . (likely) many callers just wanted to chat with their families and friends about the exciting show they had just listened to on the radio (Miller 1985, 107).

Goode (1992, 315) agrees with Miller's assessment, but also notes that to have convinced a substantial number of listeners "that a radio drama about an invasion from Mars was an actual news broadcast has to be regarded as a remarkable achievement." Either way you view it, whether tens of thousands of people became panic-stricken, or more than a million, there is no denying that the mass media have significantly influenced public perception of the event. There is also no disputing that similar broadcasts have resulted in full-fledged panics.

It Can't Happen Again

Only someone with an ignorance of history would assume that similar panics could not recur. More recent mass panics and delusions have involved the pivotal role of the mass media (especially newspaper and television). For instance, the media were instrumental in triggering a widespread delusion about the existence of imaginary pit marks on windshields in the state of Washington during 1954, erroneously attributed to atomic fallout (Medalia and Larsen, 1958). Mass delusions can also have a humorous side. During March 1993, excitement was created in Texas after *The Morning Times of Laredo* published a hoax account of a giant 300-pound earthworm undulating across Interstate 35. Many citizens in the vicinity of Laredo believed the story despite claims that the worm was an incredible seventy-nine feet long! What is not humorous is the relative ease at which a spate of media hoaxes were perpetrated across the country in the early 1990s, prompting the Federal Communications Commission to impose fines of up to $250,000 for TV stations knowingly broadcasting false information. But could a repeat of the 1938 Martian panic occur? The answer is, "Yes."

Whether tens of thousands of people became panic-stricken, or more than a million, there is no denying that the mass media have significantly influenced public perception of the event.

A widespread panic was triggered following a broadcast of the Wells play by a Santiago, Chile, radio station on November 12, 1944. Upon hearing the broadcast, many fled into the streets or barricaded themselves in their homes. In one province, troops and artillery were briefly mobilized by the governor in a bid to repel the invading Martians. The broadcast was highly realistic. It included references to such organizations as the Red Cross and used an actor to impersonate the interior minister (Bulgatz 1992, 137).

On the night of February 12, 1949, another radio play based on *The War of the Worlds* resulted in pandemonium in Quito, Ecuador, with tens of thousands of panic-stricken residents running into the streets to escape Martian gas raids. The event made headlines around the world including the front page of the February 14, 1949, edition of *The New York Times* ("Mars Raiders Caused Quito Panic; Mob Burns Radio Plant, Kills 15"). The drama described strange Martian creatures heading toward the city after landing and destroying the neighboring community of Latacunga, twenty miles south of Quito. Broadcast in Spanish on Radio Quito, the realistic program included impersonations of well-known local politicians, journalists, vivid eyewitness descriptions, and the name of the local town of Cotocallo. In Quito, a riot broke out and an enraged mob poured gasoline onto the building housing the radio station that broadcast the drama, then set it alight, killing fifteen people.

The tragic sequence of events began when a regular music program was suddenly interrupted with a news bulletin followed by reports of the invading Martians wreaking havoc and destruction while closing in on the city. A voice resembling that of a government minister appealed for calm so the city's defenses could be organized and citizens evacuated in time. Next the "Mayor" arrived and made a dramatic announcement: "People of Quito, let us defend our city. Our women and children must go out into the surrounding heights to leave the men free for action and combat." Positioned atop the tallest building in the city, the La Previsora tower, an announcer said he could discern a monster engulfed in plumes of fire and smoke advancing on Quito from the north. It was at that point, according to a *New York Times* reporter, that citizens "began fleeing from their homes and running through the streets. Many were clad only in night clothing."

Other radio adaptations of *The War of the Worlds* have had less dramatic consequences, but resulted in some frightened listeners in the vicinity of Providence, Rhode Island, on the night of October 31, 1974, and in northern Portugal in 1988 (Bulgatz 1992, 139).

What of the Future?

Since 1938, the world's rapidly expanding population has grown increasing reliant on the mass media, and people generally expect the news to contain immediate, accurate information on nearly every facet of their lives. By most projections, the twenty-first century will bring an even greater dependence on information and mass media. While it may be true that you cannot fool all of the people all of the time, as the "War of the Worlds" panics and other mass scares attest to, you need only fool a relatively small portion of people for a short period to create large-scale disruptions to society. That is the lesson we can glean from the reaction to the 1938 broadcast. It can and will happen again. Only the mediums and forms will change as new technologies are developed and old delusional themes fade away while new ones come into vogue.

Each era has a set of taken-for-granted social realities that define it and manifest in unique delusions. During the Middle Ages scores of popular delusions, panics, and scares sur-

rounded the belief that humans could transform into various animals, especially wolves (Eisler 1951; Noll 1992). In the seventeenth and eighteenth centuries, most recorded delusions were precipitated by a widespread fear of witches and manifested in episodes of mass demon possession and moral panics involving a hunt for imaginary witches (Calmeil 1845; Garnier 1895; Huxley 1952). These episodes often resulted in torture, imprisonment, or death for various minority ethnic groups including Jews, as well as heretics, deviants, the aged, women, and the poor (Rosen 1968; Goode and Ben-Yehuda, 1994). Twentieth-century mass delusions overwhelmingly involve two themes. The first is a fear of environmental contaminants mirroring growing concern about global pollution and heightened awareness of public health. This situation has triggered scores of mass psychogenic illness in schools (Bartholomew and Sirois, 1996), factories (Colligan and Murphy 1982) and occasionally communities (Goldsmith, 1989; Radovanovic 1995), and numerous delusions without psychogenic illness (Miller 1985; Goode 1992). A second series of delusions has spread widely in Western countries that have become dependent on child day care facilities. Their prominence since the mid-1980s coincides with a series of moral panics involving exaggerated claims about the existence of organized cultists kidnapping or molesting children. These myths function as cautionary tales about the inability of the weakened nuclear family to protect children (Victor 1989, 1992).

At the dawn of the twenty-first century and a new millennium, we can only ponder what new mass panics await us. It is beyond the realm of science to accurately predict what these will entail. But it will be vital for scientists to respond to the challenge of this new era of ideas and technologies that will engender an as-yet unforeseen set of circumstances that characterize and define each age. For mass panics and scares can tell us much about ourselves and the times in which we live. Part of this challenge entails remembering the lessons of the past.

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The Perils of Post-Hockery

When we engage in post-hoc reasoning, we blur the distinction between the contexts of discovery and verification and risk misplacing our faith in unwarranted beliefs. Some simple steps can avoid the seductive traps of post-hockery.

JOHN RUSCIO

How do psychologists come to believe in the diagnostic utility of responses to a series of abstract inkblots? How can each student in an entire class believe that a generic character sketch is a custom-tailored description of his or her personality? Individuals may cling tenaciously to these beliefs, despite the scientific and logical evidence that refutes them. Unfortunately, it is relatively simple for anyone with an active imagination, access to a steady supply of ambiguous data, and a willing suspension of critical thinking to "discover" and "validate" personally meaningful relationships that do not actually exist. The key is to focus on post-hoc ("after the fact") interpretations of alleged phenomena that selectively admit evidence.

Strengths and Shortcomings of Human Judgment

"Post-hockery" takes advantage of several interrelated strengths and shortcomings of human judgment. We often blur the crucial distinction between the generation and testing of hypotheses. In the *context of discovery*, our outstanding pattern-recognition and reasoning abilities are indispensible. We can detect potentially relevant environmental cues and formulate sophisticated hypotheses about underlying causal relationships. However, unaided judgment can fail us in the *context of verification*. We do not routinely subject our cherished beliefs to rigorous tests, and we often accept the first preferred explanation as fact. Particularly if this explanation is interesting or entertaining, confidence may become unshakable.

One of the surest signs of post-hockery is the inability of its practitioners to predict future events. Although successful prediction does not necessarily imply a deep understanding, the reverse is true. One who truly understands a relationship can use this knowledge to make valid predictions, whereas the post-hoc reasoner can only "explain" past events. Three examples serve to illustrate the importance of prediction in testing claims to knowledge.

The Bible Code

The recent controversy over *The Bible Code* (Drosnin 1997) stems from post-hoc reasoning. The alleged discovery of God's hidden messages actually takes advantage of post-hockery in two problematic ways. As David Thomas (1997, 1998) has exquisitely detailed, the reported probabilities of finding the messages are computed in a wildly inappropriate manner. If you look in a fantastic number of places, and count anything that you stumble upon as supportive evidence, you are guaranteed to discover meaning where none exists. That the hidden messages of the Bible Code can be found with statistically predictable regularity in a wide array of texts speaks strongly against their profundity.

A more subtle problem with the code is of special relevance here. Important messages are supposedly revealed through the juxtaposition of words such as "Hitler" and "Nazi," "Roswell" and "UFO." Here is a challenge to those who believe that the Bible contains hidden messages: *predict something*. Promoters of the Bible Code tell us that it can reveal the future, so by all means reveal it to us! If coincidental text alignments are the culprit, however, then "meaning" will be found only *after* events have transpired, and the predictive failure of the Bible Code will reveal a message that is certainly not hidden.

The "Hot Hand" in Basketball

A second example of post-hockery is the widespread belief in the streak shooting of basketball players. You would be hard-pressed to watch an entire televised game without at least once being told that so-and-so has the "hot hand." There are two distinct ways to understand this remark. It might simply indicate that a player has made a series of shots. Nobody would take exception with this descriptive use of the term. Fans, coaches, and players, however, agree that this is not the intended meaning. The term "hot hand" is used and understood in a predictive sense: the player with the "hot hand" is engaged in streak shooting that is expected to continue.

Unfortunately for its adherents, the "hot hand" label holds no predictive value. Research shows that the "hot hand" marks past success but predicts nothing (Gilovich, Vallone, and Tversky 1985). This unwarranted belief is likely due to false pattern recognition. There does seem to be something magical about a player who has made several successive shots. Fans, coaches, and players alike feel compelled to create a causal explanation rather than to accept the mundane statistical fact that when outcomes are distributed probabilistically, streaks occur by chance far more often than we imagine.[1]

Atheoretical Statistical Analyses

A third example of post-hockery stems from statistical analysis methodologies used by many researchers. Computerized data analysis, which has greatly accelerated the pace of scientific progress, provides massive input to post-hoc analysis. The enormous difficulty involved in hand calculations once restricted complex statistical analysis to explicit tests of hypotheses. These days, a few keystrokes can generate as much statistical output as an army of graduate students operating their pocket calculators all summer long. Correlating just a couple dozen variables with one another will produce a matrix containing nearly 300 correlation coefficients. By convention, results that occur at a level expected by chance just 5 percent of the time are called "statistically significant." We can therefore expect about fifteen spuriously significant correlations within every matrix of 300. Each spurious correlation is grist for the master of post-hockery.

Just as the Bible Code may seem impressive when you consider only the successful searches, reporting statistically significant results without mentioning the sheer number of tests conducted can have a powerful impact on readers. Moreover, our pattern-recognition abilities are rivaled or surpassed by the ease with which we can concoct an explanation for anything, after the fact. These fifteen spurious results will be couched in theoretical terms that convey an impressive degree of insight or understanding when they emerge in published form. The temptation to seek out and report statistically significant results is more powerful than many individuals can resist, owing both to their innate curiosity and the precarious "publish-or-perish" culture of researchers.

The Fallacy of "Personal Validation"

So the discovery of potential relationships is easy. If the distinction between contexts of discovery and verification was clear, we would not get into trouble. Research on human judgment, however, has shown how feebly we subject our beliefs to tests, if indeed we test them at all. "Personal validation" refers to our tendency to seek weak, experiential support for our

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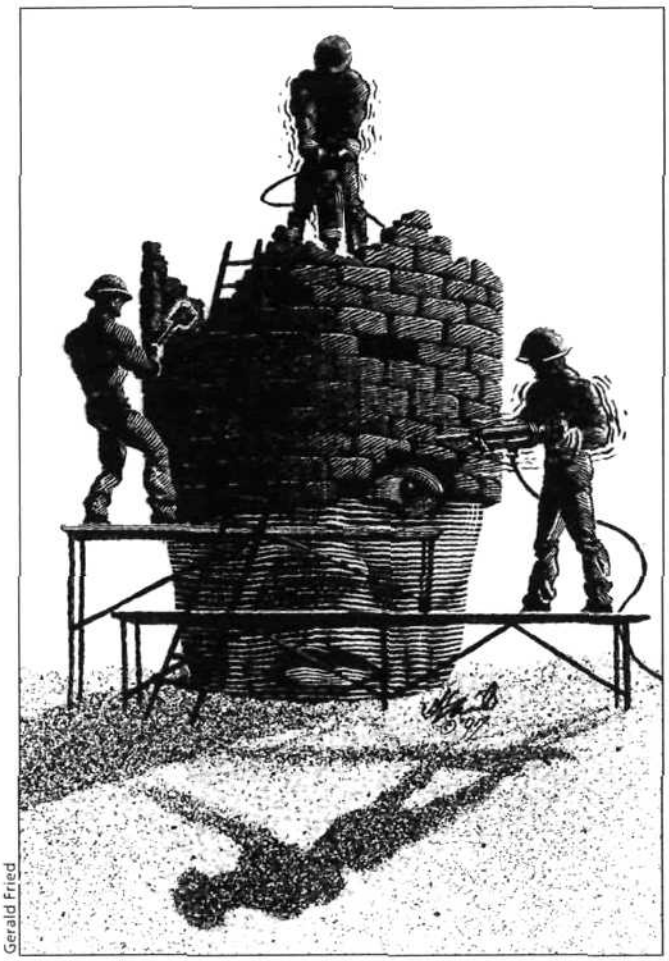

Gerald Fried

hypotheses in lieu of a more balanced pursuit of persuasive evidence. Although there is substantial overlap in many of our thinking habits, some main influences can be teased out.

Confirmation Bias

The selective search for confirmatory information shields us from relinquishing many of our cherished beliefs. Given enough ambiguous information, we can almost always ferret out some support for our beliefs. For example, consider the second question posed at the beginning of this article: How can each student in an entire class believe that a generic character sketch is a custom-tailored description of his or her personality? The trick is to use descriptions so vague that they apply to most anyone. Forer (1949) composed this character sketch, which illustrates the technique marvelously:

> You have a strong need for other people to like you and for them to admire you. At times you are extroverted, affable, and sociable, while at other times you are introverted, wary, and reserved. You have a great deal of unused energy which you have not turned to your advantage. While you have some personality weaknesses, you are generally able to compensate for them. You prefer a certain amount of change and variety and become dissatisfied when hemmed in by restrictions and limitations. You pride yourself on being an independent thinker and do not accept other opinions without satisfactory proof. You have a tendency to be critical of yourself. Some of your aspirations tend to be pretty unrealistic.

These statements do capture our personalities well, and we can find some anecdotal evidence to support all of the statements if we dig deep enough into our memories. What our evaluations lack is a consideration of the base rate likelihood that this sketch also fits *any* randomly selected person. In this case, the likelihood is quite high. Rational thought is overwhelmed by the bias toward confirmation.

When a belief is interesting or entertaining, we are especially unlikely to seek evidence that might refute it. In such cases, contradictory evidence may be perceived as less interesting and attract less attention. To demonstrate this bias, try mentioning the New York City Blackout of 1965 to someone and asking what comes to mind. In my experience, most people believe that this is when a lot of babies were conceived. There was a widespread human-interest story maintaining that a spike in the New York City birth rate occurred on Monday and Tuesday of the week nine months after the blackout. This is true, but a similar spike actually occurred every Monday and Tuesday. The cause of this anomaly: doctors preferred not to work on weekends. Induced labor and Caesarian section births were scheduled for the beginning of the week. Although this was discovered relatively shortly after the original story broke, the true explanation was noticed by few. It conflicted with post-hockery that was more interesting and more entertaining.

Employing a double standard of evidence is another common method by which evidence is biased toward confirming our beliefs. We assign great weight to evidence that favors our beliefs and ignore or discredit contradictory evidence. Consider the first question asked at the beginning of this article: Why do some psychologists believe in the diagnostic utility of responses to a series of inkblots? Gilovich and Savitsky (1996) describe the formation of pseudoscientific beliefs, such as those held by interpreters of the Rorschach inkblot test, through representative thinking: "like goes with like." In Chapman and Chapman's (1967) classic research on the use of projective tests, clinicians' interpretations were strongly biased in the direction of preconceived notions. Do all psychologists recognize the weak, experiential support for their reliance on the Rorschach?

No. Those who routinely employ the Rorschach justify this practice on the basis of extensive personal experience while rejecting a large body of empirical evidence indicating that this method has little or no diagnostic reliability or validity (Dawes 1994). Personal experience is accepted by those who believe in the efficacy of the Rorschach, whereas the experience of others or contradictory scientific evidence is grossly underweighted.

Absent or Misleading Feedback

We receive little, if any, objective feedback with which to test our beliefs. Imagine the case of a clinician who uses the Rorschach for assessment. The test is administered, responses are interpreted, and a diagnosis is reached. For a practitioner subscribing to one school of psychotherapy, a diagnostic mistake may have no consequence for the course of treatment. If therapy is held constant across patients, how can a diagnostic error ever be detected? Belief in the utility of the Rorschach

becomes invulnerable due to a lack of corrective feedback.

Suppose, instead, that successful treatment hinges on a correct diagnosis. Will a clinician receive corrective feedback even when an incorrect diagnosis is made, and an ineffective therapeutic technique used? Given the usual reasons why patients seek counseling and the dynamics of the patient-therapist relationship, it should come as no surprise that patients tend to accept and agree with their therapists' diagnoses and advice. Incorrectly diagnosed individuals will often believe that they are receiving the best available treatment. The lack of treatment success is a fact that emerges so slowly and gradually that it may never arouse suspicion. Even if it does, neither the therapist nor the patient is likely to question the validity of the original diagnosis, much less its evidential basis. There are many ready-made alternatives. Perhaps this is an atypical case. Perhaps therapy did not begin early enough. Perhaps the patient is resistant to the therapist (or vice versa). We can generate countless alternative explanations for disappointing outcomes, none of which will calls into question a cherished belief.

The feedback that we do obtain, as a rule, is systematically misleading. Many types of feedback are exclusively positive in nature or easily distorted to become so. How do we evaluate our teaching skill? Standardized rating forms can be dismissed as worthless, thrown on the same heap with all else that is standardized—just ask any poor teacher. We learn from experience. Which of our former students will keep in touch with us? Which students ask for letters of reference? If a student enrolls in another of our courses, this is clear confirmation of teaching skill (never mind that we teach required courses). The student who does not do so, in the unlikely event that we notice, is assumed to have had other commitments that created a scheduling conflict.

We selectively expose ourselves to situations and environments containing only favorable information. We tend to associate with people who think the way that we do, read books and articles that support our views and discard those that do not, join clubs and organizations to interact with others who share our interests, and so forth. With all of these defensive measures in place, where will corrective feedback come from?

Hindsight Bias and Overconfidence

Once we have discovered a personally meaningful relationship, unearthed confirmatory evidence, and received flattering feedback, 20/20 hindsight monopolizes our vision. We begin to feel that we "knew it all along" (Fischhoff 1975), replacing speculation with certitude through a process of "creeping determinism" (Fischhoff 1980). We come to hold undue confidence in our beliefs. Because most everyone is overconfident much of the time—despite feelings to the contrary—perhaps the best way to demonstrate this point is for you to test your own confidence.

Plous (1993) has devised a simple test of factual knowledge to evaluate confidence. For each of ten questions, you construct an interval such that you are 90 percent confident it will contain the correct answer. Thus you might say, for Question 1 below, that you are 90 percent confident that Martin Luther King's age at the time of his death was somewhere between ___ years and ___ years (you fill in the blank). The key to this assessment is not whether you know the exact answers—although you may for some questions—but whether you can construct 90 percent confidence intervals that are actually correct 90 percent of the time. Here, now, are the ten questions:

1. What was Martin Luther King, Jr.'s age at death?
2. What is the length of the Nile River, in miles?
3. How many countries belong to OPEC?
4. How many books are there in the Old Testament?
5. What is the diameter of the moon, in miles?
6. What is the weight of an empty Boeing 747, in pounds?
7. In what year was Mozart born?
8. What is the gestation period of an Asian elephant, in days?
9. What is the air distance from London to Tokyo, in miles?
10. What is the deepest known point in the ocean, in feet?

The answers to these questions, as of the 1993 publication of Plous's book, appear in Note 2. If you got all ten questions correct in this way, you are *underconfident*, not to mention a member of a breathtakingly small minority! If you got exactly nine questions correct, your confidence is *properly calibrated* to your accuracy level; this, too, is exceedingly rare. If you got fewer than nine questions correct, you are *overconfident*, like the vast majority of us. Although this quiz may seem trivial, it is just one method of eliciting confidence judgments. Overconfidence is in fact a pervasive problem across many types of beliefs, tasks, and situations (Alpert and Raiffa 1982; Oskamp 1965), and it is every bit as common among experts as laypersons (Dawes 1994; Faust and Ziskin 1988).

Foiling Post-Hockery: Some Advice

If post-hockery is the disease, then what is the cure? Scientific psychology documents flaws in our reasoning, but it also offers suggestions for improvement. Healthy thinking habits do take some practice, but the payoff is a more rational belief system. Here are three concrete strategies for reducing susceptibility to post-hockery.

Formulate Multiple Alternative Hypotheses. Throughout his illustrious career, Carl Sagan was an advocate of skepticism, wonder, and the proper balance between the two. In the context of discovery, exercise a great deal of wonder. The best known method for minimizing the judgmental shortcomings associated with post-hockery is the consideration of alternative hypotheses (Arkes 1991, McDonald 1998). Confidence in any particular belief is appropriately reduced by the existence of several alternative hypotheses. Stronger evidence must be sought to evaluate competing theories, and the correct hypothesis is more likely to be included in a larger pool of possibilities.

Apply Consistent Standards of Evidence. In the context of verification, exercise a great deal of skepticism. Subject your beliefs to the same rigorous tests that you demand of others. Those with the toughest standards of evidence will acquire and retain the most accurate beliefs. Be open to the possibility that the pattern you believe you are observing may in fact be random fluc-

tuations. In his book *Statistics as Principled Argument,* Robert Abelson (1995) sums this up nicely by urging readers to "give chance a chance." When you find yourself proclaiming something as meaningful and important, ask yourself whether you would accept someone else's idea on the same evidentiary basis.

Ask What Can Be Predicted. When you can only see meaning in data by looking backward, post-hockery is strongly indicated. You do not truly understand a phenomenon until you can generate testable predictions. Every one of the examples of unwarranted belief cited in this article could have been avoided if its creator had been challenged to make predictions. When someone makes a claim to knowledge ask, by way of evidence, "What can you predict?" Adding this simple habit to one's repertoire of critical thinking skills will help to clearly differentiate the context of discovery from that of verification. The ability to spot post-hockery in an argument, one's own or another's, is well worth a bit of practice.

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Notes

1. This by no means implies that the outcomes of shots are determined by chance. In fact, nothing could be further from the truth. A wide range of factors contribute to success: a player's baseline skill level, the difficulty of the attempted shot, the strength of the defense, and so forth. What the research does indicate is simple: if you had a complete listing of the causal factors determining the outcome of an attempted shot, the success of previous shots would not appear on it.

2. (1) 39 years. (2) 4,187 miles. (3) 13 countries. (4) 39 books. (5) 2,160 miles. (6) 390,000 pounds. (7) 1,756. (8) 645 days. (9) 5,959 miles. (10) 36,198 feet. □

INVESTIGATIVE FILES

from page 25

she stated, "It still functions, though people aren't allowed to go up it very often" (Bobbin 1998). It would thus appear that the Loretto staircase is subject to the laws of physics like any other.

The other mysteries that are emphasized in relation to the stair are the identity of the carpenter and the type of wood used. It seems merely mystery mongering to suggest that there is anything strange—least of all evidence of the supernatural—in the failure to record the name of an obviously itinerant workman.

As to the wood, that it has not been identified precisely means little. The piece given to a forester for possible identification was exceedingly small (only about 3/4-inch square by 1/8-inch thick) whereas much larger (six-inch) pieces are preferred by the U.S. Forest Service's Center for Wood Anatomy (which has made many famous identifications, including artifacts taken from King Tut's tomb and the ladder involved in the Lindbergh kidnapping) (Knight 1997). The wood *has* reportedly been identified as to family, *Pinaceae,* and genus, *Picea*—i.e., spruce (Easley 1997), a type of "light, strong, elastic wood" often used in construction ("Spruce" 1960). But there are no fewer than thirty-nine species—ten in North America—so that comparison of the Loretto sample with only two varieties (Easley 1997) can scarcely be definitive.

In the final analysis the "mysteries" of the spiral staircase at the Loretto Chapel are evidence, not of its miraculous production but instead of its human—quite fallibly human—manufacture.

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May the Force Be With You

Empty space is full of invisible force fields, and we can detect electromagnetic fields from the farthest reaches of the universe. So couldn't our thoughts generate electromagnetic fields that might be sensed by other people? Here's the problem.

LAWRENCE M. KRAUSS

You gotta love this place. Every day is like Halloween!
—Fox Mulder

Early in the first film of the *Star Wars* trilogy, Obi Wan Kenobi urges Luke Skywalker to "feel the Force!" To no one's surprise, Luke does, eventually, and it is very very good to him. It was also very, very good to George Lucas. A billion dollars and twenty years later, the Force is still with us.

Tell me that you have not, at some time in your life, looked up at the night sky and shuddered at the vast loneliness of our existence. Or, sitting alone in a darkening room, perhaps in a remote cabin in the woods, have you never, as a barely perceptible chill breeze brushed your skin, had an idea that there might be some "thing" in the room with you,

which you cannot see? What are the things that go bump in the night?

Dark side or not, there's something particularly cozy about an invisible Force that ties the universe together and gives it meaning, coherence, legitimacy. Pondering the existence of aliens may be how we ease our innate human loneliness nowadays, but pondering the existence of invisible forces is nothing new. Such musings are, after all, at the heart of most of the world's religions, whose annual gross stretches back for millennia and makes Lucas's look like chicken feed.

In fact, invisible forces are not merely the stuff of revelation: they *are* everywhere! Turn on your radio, and suddenly there is music, borne by invisible radio waves. Leap into the air, and the force of gravity pulls you back to Earth. Pluck a couple of magnets off the refrigerator and feel them push away from each other. As a matter of fact, there is almost no such thing as a visible force! I say "almost" because, of course, if a piano falls on your head, the source of the force you feel (before you feel nothing anymore) is eminently visible! Or is it? What is it about the piano that makes it "material"? Why does it crush your skull?

This might seem like a silly question; after all, what could be more solid than wood, ivory, metal, all the things from which a piano is fabricated? Well, a piano, at the fundamental level, is made of billions and billions of atoms. You can therefore reasonably assume that the particles in the atoms in the piano smack up against the atoms in your head and the multiple collisions are what cause one of these atomic aggregates to spatter.

Ah, nothing could be further from the truth. No particle in any atom in the piano—no proton, neutron, or even electron—ever gets close, on an atomic scale, to any particle in any atom in your skull. Most of what we like to think of as "matter" is actually empty space. The region in which electrons orbit an atomic nucleus is more than 10,000 times as large as the nucleus itself. It's the invisible electric forces emanating from the charged particles in the atoms in the piano that repel the charged particles in the atoms in your head and do such a good job of making both your head and the piano seem solid.

Physicist Richard Feynman used this idea to relate the strength of the electric force to the gravitational force. I will repeat his argument here, changing it slightly so we can continue to speak in terms of your head and the piano. But instead of dropping a piano on your head, let's drop your head on a piano from, say, 100 floors up. Let's assume you are at the top of the Empire State Building, which I seem to remember from my youth has 102 stories. And say that you manage to climb over the high fence around the observation deck and do a swan dive toward the ground below. At the same instant, some piano movers have taken a union-required break from their chore of moving a new concert grand into the lobby of the building. The piano is still in several pieces, which are lying on mats on the sidewalk. Suddenly the movers look up, and to their horror they see you hurtling earthward. You land on the instrument's elegant, polished wooden lid, which is lying flat on the ground.

Now, says Feynman, gravity has been accelerating you for 102 stories, but you don't continue your descent toward the center of the Earth: The electrical force—in this case between the atoms in the lid (in turn supported firmly by the sidewalk) and the atoms in your head—stops you cold in a fraction of an inch! Despite its spectacularly noticeable effects, gravity is the weakest force in nature.

Even this example doesn't do justice to how weak gravity really is compared to the electric force. Here's another one: Take a single electron, which has a small electric charge associated with it. If I put another electron near it, they are repelled by the electric force between them. In empty space, where no other forces were around to balance this force, they would fly apart. Now, say I wanted to pin the second electron down by putting a large mass on top of it, so that the gravitational attraction of the large mass (plus the electron) toward the original electron would exactly balance out the electric repulsion between the two electrons. How big a mass would I need?

When I asked my wife this question, she asked how far apart the two electrons were, which is a good question. However, in this case it is irrelevant, because both the electric force and the gravitational force vary the same way with distance, so if they balance out at one distance, they will balance out at all distances. In any case, the answer is nothing short of flabbergasting. Plugging in the relative strengths of gravity and the electric force, it turns out that the mass you have to put on top of the second electron to counteract the electric repulsion is—get this!—5 billion tons. This is not only more massive then either the Empire State Building or the twin towers of the World Trade Center, or any other Manhattan skyscraper, it is more massive them all of them put together!

Even though I have been for some time familiar with the relative strengths of gravity and the electric force, I was surprised by this particular result after obtaining it—so much so that I had to check my calculations three times and then ask a graduate student who happened to be walking by my office to check them to make sure I hadn't done something foolish. This time, I hadn't.

Why, you may naturally ask, don't we just use small electric charges to levitate buildings or large flying saucers? The answer is that these objects, if they are at Earth's surface, are not merely attracted downward by the gravitational force of the single electron that one might hope to levitate them with, they are attracted by the whole Earth. And since Earth is massive indeed, their "weight" at Earth's surface is enormous compared to the force of electrostatic repulsion between electrons located any reasonable distance apart. On earth, all these skyscrapers are extremely heavy, but in empty space they are nearly weightless. The reason that all of these skyscrapers combined are needed to

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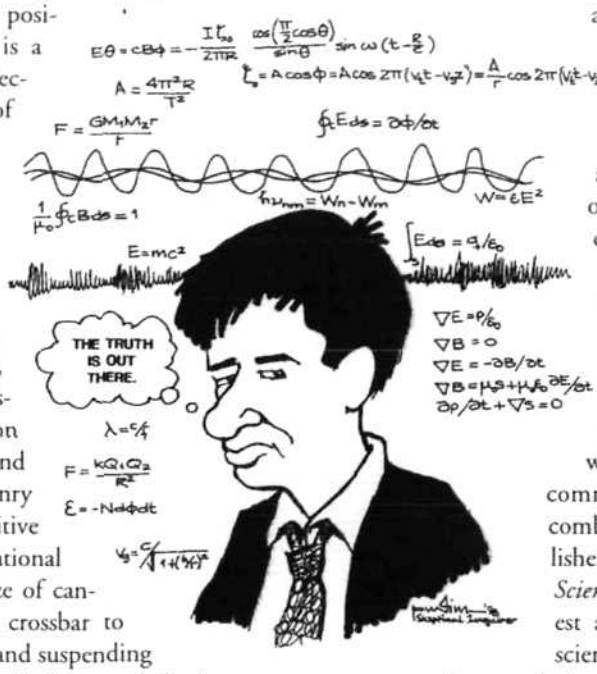
balance the electric force with gravity in empty space is not that this electric repulsion is so great but that the gravitational attraction of the electron on each of these objects is so small.

Gravity is so weak that it is almost miraculous that we can detect it at all. The reason we "feel" gravity is that although the pull of each individual atom in the earth on each individual atom in my body is unbelievably small, the effect adds up, so that the attraction of *all* the atoms in the earth on each atom in my body is substantial (most noticeably in the morning, just after my alarm goes off). We don't "feel" the electromagnetic force in this way, because the negative charges in our body are exactly canceled by the positive charges in our body. This is a good thing; if it weren't so, the electric forces would explode us out of existence.



As weak as gravity is, we can still measure the gravitational attraction between human-scale objects. (The attraction between single atoms is so small that there's no hope of measuring it directly in the near future.) In fact, about 100 years after Newton's discovery of the law of gravity based on the motions of the planets around the sun, a fellow Englishman, Henry Cavendish, came up with a sensitive method to measure the gravitational attraction between objects the size of cannonballs by attaching two to a crossbar to form a kind of dumbbell balance and suspending it from a wire. He then moved a third cannonball close to one end of this contraption and measured the infinitesimal torque this produced on the wire. In this way, the fundamental strength of gravity itself—the so-called gravitational constant—was determined. Previously, one could use Newton's law to calculate the strength of the gravitational force between planets and the sun, or between Earth and the Moon, for example. However, the mass of these objects was not independently known; one could not determine how strong the gravitational force was between objects of known mass in this way. After Cavendish's experiment, not only was this measurement possible, but one could put the gravitational constant into Newton's law and in this manner *weigh* the planets and the sun. The current best measurement of the mass of the sun was calibrated using this technique.

The purpose of my discourse on gravity's weakness, however, is not to bury gravity but to praise it. There is nothing basically wrong with imagining a universe full of invisible things, some of which are beyond our control. The universe is full of invisible things, some of which *are* beyond our control! We should think about gravity whenever we ponder the Big Question that has stirred our imaginations for centuries (and inspired much of modern science fiction): What invisible things are still invisible?

At the top of the list, anyone's list, must be ESP. It's difficult to name a major work of science fiction or fantasy that does not somewhere contain an element of telepathy. Each of the *Star Trek* series, for example, has had its telepaths: Spock, Deanna Troi, her mother Lwaxana, Kes—to say nothing of a host of telepathic aliens on various planets. The aliens in *The X-Files* perform telepathic mind scans; and even the disgusting creatures in *Independence Day,* whose only purpose in life seemed to be to kill other species, used telepathy as a weapon.

How many times have you felt that you knew what someone else was thinking? Certainly, as we become accustomed to reading body language and facial expressions, we can sometimes anticipate other people's reactions, or even divine what is on their minds. Is it all that crazy to imagine that with one more step we could communicate without speech?

The term "extrasensory perception" was coined by the Duke University researcher Joseph Banks Rhine, who wrote a well-known book by this name in 1934 in which he claimed to have overwhelming evidence for telepathic communication. His popularizations, combined with the interest of the publisher of the pulp magazine *Astounding Science Fiction,* helped fuel public interest and inspired a raft of ESP-related science fiction. Rhine also coined the term "parapsychology," for the study of various kinds of alleged psychic phenomena.

Alas, the invention of these two serviceable terms was probably Rhine's greatest contribution to science, since essentially all of his ESP results that were subjected to outside scrutiny were shown to be flawed—including his first discovery, Lady Wonder, the telepathic horse. While the flawed experiments of one researcher cannot be used to dismiss a whole field, the following facts are not in dispute:

1: In the more than sixty years since Rhine created the field, there has been not a single definitive experiment broadly accepted—that is, by scientists not directly involved in similar lines of research—which unambiguously demonstrates the reality of any of the phenomena he set out to explore and promote.
2: At the same time, huge numbers of people, including a number of active workers in this field, believe that ESP exists.

I know better than to try and resolve this debate. Moreover, I have never personally tried to verify or debunk any specific set of ESP experiments. I'm skeptical, but then I try to be skeptical of everything (I don't believe there's any other way to learn about how the world really works). But I don't want to directly ques-

tion here the quality of current research in this area. Rather, I want to ask a question I think is more enlightening, not to mention more fun: *What would be required for ESP to exist?*

I find it significant that the furor over telepathy and ESP began within a few decades of the invention of the radio by Guglielmo Marconi, and less than one decade after its first widespread usage. Once wireless communication became a reality, the idea that invisible "waves" of some sort could lead to direct nonverbal communication between people probably became a lot more plausible. Until then, the only nonverbal communication that didn't make use of some overt physical connection between source and receiver involved visible light, so that any suggestion that one might receive invisible signals was completely unprecedented. Radio waves fit the bill perfectly.

There are so many remarkable aspects of radio waves (which, like visible light, are electromagnetic waves, but of much lower frequency), that it's hard to know where to begin talking about them. First and foremost, in spite of both the curvature of the earth and the long distances involved, shortwave radio signals can be received on the other side of the planet. Moreover, though radio waves carry very little power, they can be precisely detected. The most striking illustration of this sensitivity is afforded by the marvelous Arecibo radio telescope in Puerto Rico. Built in a natural crater surrounded by tropical vegetation, the Arecibo antenna is 1,000 feet across, and viewers of the movie *Contact* will recognize it. It has detected radio waves from the surface of Venus, from rotating neutron stars thousands of light-years away, and from extragalactic objects hundreds of millions of light-years away. I toured the facility with the assistant director a while back along with my wife and daughter, and I remember trying to think of a way to convey how sensitive this beautiful device was. Based on the sensitivity data for the instrument, I worked out that it could easily detect a 25-watt lightbulb on Pluto, several billion miles away, if instead of generating visible light the bulb emitted its energy as a radio frequency accessible to the telescope's receivers.

Well, if we can detect such small sources located in the outer reaches of the solar system, why shouldn't two minds be able to communicate across a room? After all, thinking itself involves precisely the same processes as those that produce electromagnetic disturbances. Thoughts and actions are initiated by the firing of neurons in our brains, which produce electrical currents, which in turn travel to nerves and muscles elsewhere in our body. Electrical currents are precisely what generate electromagnetic waves.

On the surface, the forces of electricity and magnetism seem very different. Permanent magnets exist, but they behave quite differently than electric charges do. For example, if one cuts a magnet in half, one does not produce an isolated north pole and an isolated south pole; instead, one gets two smaller magnets, each with a north and south pole. But if I bisect an object with a positive electric charge on one side and a negative charge on the other, I will end up with one positively charged object and one negatively charged object. There is clearly some connection between electricity and magnetism, however. For example, I can create a magnet by moving charges to produce an electric current. These electromagnets are standard components in almost every electric appliance in your house.

Near the end of the nineteenth century, one of the greatest theoretical physicists of that era, the Scottish physicist James Clerk Maxwell, arrived at one of the greatest intellectual unification of ideas that has ever taken place. He demonstrated conclusively not only that electricity and magnetism were related but that they were really just different aspects of the same thing. One person's electricity is another person's magnetism, depending on the reference frame.

Besides setting the stage for relativity theory, which is based on this principle, Maxwell's theory of electromagnetism made a central prediction: Light is a wave of electricity and magnetism. The interplay between electricity and magnetism was such that whenever you jiggled an electric charge, a "wave" of electric and magnetic disturbances traveled outward at a speed that could be calculated from first principles. This speed turned out to be the same as the measured speed of light. We now understand that the frequency with which you jiggle the charge determines the measurable characteristics of the resulting wave. If you jiggle it back and forth only a million times per second, you will produce radio waves. If you jiggle it back and forth a billion times per second, you will produce microwaves. If you jiggle it back and forth a million billion times per second, you will produce visible light. And so on.

You might ask, what is it exactly that is propagating in an electromagnetic wave? What is there in the wave itself, and what will the wave do when it encounters matter? Here we have to thank another remarkable nineteenth-century British physicist, Michael Faraday. Faraday is in some ways a more romantic figure than Maxwell. Without a formal education, as a mere bookbinder's apprentice, he attended a public lecture in 1812 at the esteemed Royal Institution, in London, given by the brilliant chemist Sir Humphry Davy. Sometime later he returned to the institution with the lecture notes he had taken, bound into a handsome volume. Davy was so impressed that he took Faraday on as an assistant. The rest is history.

The particulars of this history involve a number of seminal discoveries about the connections between electricity and magnetism which set the stage for Maxwell's work. But the one I want to focus on here is one that changed forever the way physicists think about empty space. Faraday was an intuitive, seat-of-the-pants type of thinker, which is one reason I like him so much. Prior to Faraday, when physicists thought about forces, like gravity, they pictured the equations that governed these forces. Faraday provided a more intuitive, physical picture, which in some ways is far more valuable.

From the moment Newton discovered the universal law of gravity, he and others were puzzled by the question, How does the Moon know Earth is there in order to be attracted by its gravitational pull? That is, what exactly is it that communicates the force of gravity? Is that force instantaneous, or does it take time to reach the Moon?

Newton never resolved these thorny questions, and preferred to move on to other things, including becoming head of

the British Mint. Some 200 years later, however, Faraday pondered the same questions, but this time in the context of the electric forces between particles. To help himself understand why the electric force behaves the way it does, he imagined that emanating from every charged particle was an electric "field." He pictured this field as a set of lines radiating outward in space from the particle in every direction. If he imagined the number of lines as proportional to the magnitude of the electric charge on the particle, Faraday could then understand why the electric force dropped off in strength with the square of the distance between charged objects. If I start out with a certain number of field lines emanating from a charge, and each one heads out in a straight line to infinity, the field lines will diverge. Therefore, the number of field lines that cross any given area at a certain distance will decrease with the square of the distance.

Now, this is a nice picture, but is it more than just a metaphor? Often physicists create pictures to give themselves a clearer understanding of how the laws of nature work, but are these pictures ever the image of the reality itself? Sometimes the answer is a surprising yes. Faraday's fields are such an example, and soon took on a life of their own. It was shortly understood that under certain conditions electric and magnetic fields could be generated simply by the presence of other electric and magnetic fields, without the presence of the electric charges that caused one to invent the fields in the first place.

When physicists nowadays think of empty space—space devoid of matter—they realize that it's not necessarily empty. We now think of the electric force, and also the gravitational force, as follows: A charged particle creates an electric field around itself, and a massive particle creates a gravitational field around itself. These fields propagate at the speed of light, and a far distant object can interact with them and be attracted or repelled. Because it takes some time for the fields to propagate, the Moon, for example, will be gravitationally attracted to where Earth was at the time the field with which the Moon is interacting was created. If Earth moves in the meantime, the Moon will nevertheless move toward the original place—that is, until the field created by the now-moved Earth propagates out to the position of the Moon. Because these fields propagate at the speed of light, we don't normally notice the delay on a human timescale. However, when cosmic distances are involved, the effects of the finite propagation speed of gravity can be dramatic. For example, the Milky Way is falling toward a huge galactic group some 50 million light-years away. In the time it has taken for the gravitational field of the huge cluster of galaxies to propagate to the region of our own galaxy, the cluster has moved from the position to which our galaxy is being attracted by perhaps 100,000 light-years, a distance comparable to the Milky Way's diameter!

Empty space is full of fields. A million years after I jiggle an electric charge here on Earth, the changing magnetic and electric fields have propagated a million light-years away, where they can cause an electric charge in an antenna attached to a radio receiver to jiggle up and down, producing a response in the receiver. The opening sequence of *Contact,* in which we pass slowly out through space, following the stream of electromagnetic waves emanating from our radio and TV broadcasts as they make their way through the universe, is a wonderful illustration of this idea.

We sense directly only a small part of all the electromagnetic waves out there. This spectrum includes waves with frequencies to which the electrons in the atoms in our eyes can respond, sending signals to our brain which we interpret as one or another color. Waves of slightly lower frequency are invisible to us, but we nevertheless feel them as heat. Waves of slightly higher frequency are invisible—to us, though not to, say, bees—and we don't feel them at all, but they damage our skin and produce dangerous but apparently appealing suntans.

What could be more New Age than this? An invisible world full of electromagnetic fields all around us, some of which we generate by our own thought processes. How cosmic . . . ! Why couldn't our thoughts generate weak fields that might be sensed by individuals with just the right kind of antennas built into their brains?

But this is a case of too much of a good thing. Electromagnetic fields are remarkably good at propagating and producing effects. But if they produce effects, they are by definition *observable.* That's the way the world works. If I think very hard—whatever that means—and try to produce a response in your mind, that means I must induce some chemical or electric response in the neurons in your brain. But unless you think your brain behaves differently from any other sort of antenna in the universe, then the signal I send to your brain should be detectable by radios or other types of electromagnetic receivers in the vicinity.

There's no doubt that the most sensible carrier for telepathic messages would be electromagnetic waves. There's no doubt that they are directly associated with the operation of your thought processes. We have detected "brain waves" and can even measure the external electromagnetic signal they produce. But electromagnetic waves from the other end of the universe are detectable by receivers here on Earth. Why should such receivers be less efficient at receiving telepathic messages than your brain is? The fact that no one has ever detected electromagnetic waves associated with ESP is pretty damning, don't you think?

Maybe the electromagnetic waves associated with telepathy are so weak that existing detectors are insensitive to them? But they can't be too weak to generate some physical disturbance in the brain of the recipient. This would entail carrying enough energy to cause an electron to jiggle, or an atomic spin to wobble, or something. But this same something can be used as the basis of some detection apparatus or other. Existing detectors of visible light can detect, for example, individual photons. We can build X-ray detectors to see through what we cannot see through with the naked eye, infrared-sensitive cameras to spy on our neighbors in the dark. The bottom line is that there is nothing more detectable in the universe than electromagnetic waves, as hidden as they seem.

No, this is another case where Fox Mulder's maxim, "The easiest explanation is also the most implausible," holds true. If ESP is to work, there's gotta be another way—something not quite so easy. □

Diagnosis and Therapy Gone Haywire

SCOTT O. LILIENFELD

Hoax and Reality: The Bizarre World of Multiple Personality Disorder. By August Piper, Jr., M.D. Jason Aronson, Northvale, N.J., 1997. ISBN 1-56821-854-0. 232 pp. Paperback, $30.

Few issues in contemporary psychology and psychiatry are as contentious as the diagnostic status of multiple personality disorder (MPD). MPD, now known formally as dissociative identity disorder, is ostensibly characterized by the simultaneous existence of two or more personalities or personality states within the same individual. Although the diagnosis and etiology of MPD are foci of intense controversy, all of the protagonists in this often acrimonious debate agree on one fact: the reported incidence of MPD has skyrocketed over the past several decades. In the early part of the twentieth century, the number of reported cases of MPD was barely 200. As we approach the end of the century, this number has swelled into the tens of thousands, and some MPD specialists claim to have seen several hundred cases in their own diagnostic practices alone.

It is here that the consensus ends. MPD proponents contend that the epidemic of reported cases is largely or entirely a consequence of improved assessment practices: clinicians of previous generations lacked the diagnostic acumen and skills necessary to detect

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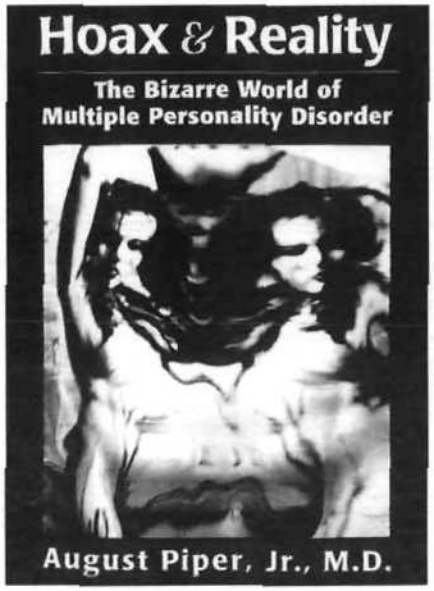

MPD's puzzling symptoms. In contrast, MPD skeptics maintain that this epidemic is a product of iatrogenic (treatment-induced) practices in conjunction with heightened societal awareness of MPD's diagnostic features. Skeptics do not assert, as is sometimes believed, that most individuals with MPD are consciously faking this diagnosis, although the celebrated case of Kenneth Bianchi, one of the Hillside Strangler murderers, illustrates that intelligent individuals intent on malingering the symptoms of MPD can fool even seasoned clinicians. Instead, skeptics contend that individuals with MPD are unknowingly playing the parts of a cast of characters in a nightmarish drama produced and directed by those entrusted with helping them.

In his provocative and superbly written book, *Hoax and Reality: The Bizarre World of Multiple Personality Disorder,* August Piper argues persuasively that the roots of the MPD epidemic can be traced to the diagnostic and treatment practices of clinicians, expectations communicated by the media, and widely available information regarding MPD's diagnostic features (see also Piper's article, "Multiple Personality Disorder: Witchcraft Survives in the Twentieth Century" in the May/June 1998 SKEPTICAL INQUIRER). According to Piper, clinicians who suspect that a patient's bewildering symptoms (e.g., moodiness, inexplicable temper outbursts) are the product of inner-dwelling identities will often attempt to elicit these identities through suggestive questioning (e.g., "Might there be another part of you I haven't met?"), forceful prompting, and hypnosis. In certain patients, particularly those prone to fantasy, such attempts are successful. A diagnosis of MPD is thus born.

Piper contends that the diagnostic criteria for MPD are so vague and elastic that clinicians determined to find evidence of alternate personalities ("alters") will typically succeed even when the symptoms of MPD are absent. This problem, Piper notes, is compounded by the fact that some clinicians, such as Bennett Braun, posit the existence of "special-purpose frag-

ments," alters that appear only on highly circumscribed occasions (e.g., such as while cooking). Special-purpose fragments render the diagnosis of MPD virtually impossible to falsify, because the clinician can invoke the existence of these fragments to account for almost any enigmatic behavior.

Piper's arguments are consistent not only with the recent epidemic of MPD cases, but also with the dramatic increase in the number of alters over the course of the twentieth century. Whereas turn-of-the-century MPD patients almost invariably reported one or two alters, recent MPD patients have reported alters numbering in the hundreds or even thousands (Piper cites one therapist who reported a patient with 4,500 alters). Moreover, whereas the alters of early MPD cases were typically garden-variety humans, the alters of recent cases have included animals, demons, Mr. Spock, and even Teenage Mutant Ninja Turtles. Piper's arguments may also help to explain an intriguing finding noted by the late Nicholas Spanos, namely that the lion's share of MPD cases derive from a small number of clinicians. Although this finding can be interpreted in several ways, it raises the disturbing possibility that certain therapists have an uncanny knack of eliciting or "detecting" the symptoms of MPD in their absence.

Perhaps the most significant contribution of *Hoax and Reality* is its systematic and meticulous dismantling of the assertions of MPD's most vocal advocates. By demonstrating how the writings of MPD proponents frequently contradict their own claims, Piper shows that upon careful examination much of the standard MPD literature degenerates into a morass of inconsistencies. For example, psychiatrist Colin Ross and other MPD advocates insist that their treatment practices explicitly discourage patients from thinking of their alters as discrete personalities. Yet Piper demonstrates that Ross's published statements and treatment practices contradict this assertion. For instance, Ross describes his use of a technique called the "inner board meeting," in which each alter is asked to enter an imaginary boardroom along with other alters. Still other MPD therapists conduct "internal group therapy," in which alters are encouraged to discuss their problems with each other. Such practices, Piper contends, inadvertently reinforce patients' displays of multiplicity.

Moreover, MPD advocates have long been hard-pressed to answer a nagging and rather embarrassing question: How could generations of clinicians have managed to miss such an obvious diagnosis? MPD proponents have generally responded by claiming that the symptoms of this condition are in fact subtle and easily overlooked. Piper argues convincingly, however, that this assertion defies both data and common sense. He demonstrates that the MPD literature is consistent with a more parsimonious explanation: in most cases the symptoms of MPD were never there to begin with and appeared only after therapy was initiated.

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Despite its strengths, the book falters on at least two counts. First, Piper does not directly address several arguments believed by proponents of the MPD diagnosis to provide convincing refutations of the skeptical position. Because *unanswered* is easily confused with *unanswerable*, readers familiar with this literature may erroneously conclude that Piper has no ready rejoinder to these commonly advanced arguments. For example, MPD advocates frequently refer to studies that have revealed few or no symptomatic differences between MPD patients who have and have not been hypnotized, and then use these findings to argue that the etiology of MPD is not iatrogenic. But research has repeatedly demonstrated that hypnosis contains few, if any, unique features that facilitate responsivity to therapists' suggestions. Leading questions and prompts outside of the hypnotic context may be equally likely to encourage clients' adoption of multiple roles.

Second, Piper introduces unnecessary confusion toward the end of the book by distinguishing the recent spate of MPD cases produced primarily by iatrogenic factors from "genuine" MPD, which he believes to be extremely rare. A more parsimonious hypothesis, which Piper does not consider, is that once cases of malingered MPD are excluded, all cases of MPD are "genuine" in that its sufferers are engaged in the enactment of imaginary identities. Some cases of MPD, however, may be primarily influenced by iatrogenic factors, whereas others may be primarily influenced by widely disseminated societal "scripts" concerning the expected symptoms of MPD. The fact that a condition is largely a product of iatrogenesis does not render it any less real. But it does suggest that the modern-day epidemic of MPD is more a product of creation than of discovery.

These faults notwithstanding, *Hoax and Reality* remains an extremely valuable contribution to the MPD literature. If readers place this book alongside Nicholas Spanos' brilliant *Multiple Identities and False Memories: A Sociocognitive Perspective* (1994) (see the July/August 1997 SKEPTICAL INQUIRER for Robert A. Baker's review of this book), they will obtain a devastating binocular view of the therapeutic and diagnostic practices of MPD's most vociferous proponents. *Hoax and Reality* provides a fascinating, if chilling, account of a contemporary epidemic that is as much sociological as psychological in origin.

The Magic of Magic

ROBERT A. BAKER

Abracadabra: Secret Methods Magicians and Others Use To Deceive Their Audience. By Nathaniel Schiffman. Prometheus Books, New York, 1997. ISBN 1-57393-163-7. 441 pp. Hardcover, $27.95.

Anyone interested in magic—and skeptics ought to be—should buy and read this book. Schiffman, who is also a professional magician, has written *Abracadabra* as a four-hundred-page love letter to his craft. In doing so, he has provided the public with a definitive look at the art and science of conjuring as well as a comprehensive overview of tricks, secrets and illusions in use for literally thousands of years.

In fact, very little in magic is new, since the same magical forms have been in use for centuries and the modern conjuror still employs them but is able to add to them some of the benefits of modern science. As Schiffman tells us, these forms consist of: the production of an object; the evanishment of an object; the transposition of objects, the change in form, size, weight, color, or temperature of objects; the penetration of one solid object by another; the defiance of the laws of gravity; proof of invulnerability; making the inanimate animate; making whole something that has been destroyed; accelerating a natural process; and producing pseudopsychic phenomena, e.g., telepathy, precognition, or thought-transference, i.e., mentalism. These forms summarize nearly all of the kinds of misdirections and illusions that are used to deceive the observer. Of course, some magicians may use a combination of several of these forms as they strive to leave their audiences awestruck.

While nearly anyone can learn to do magic tricks and fool their fellow man with a few hours of practice, becoming a skilled magician requires much, much more. Schiffman systematically and convincingly spells out just what is needed for an amateur magician to become another Randi or David Copperfield. Although excellent manuals and handbooks abound for the would-be magician, Schiffman's instruction is vastly superior in that he concentrates on the need to develop the attitude, the philosophy, and the spirit of the magical enterprise rather than just learning how to "do a few tricks." *Abracadabra* is filled with insightful and illuminating quotations and bits of wisdom from the best magicians of all time—Robert-Houdin, Maskelyne, Houdini, Dunninger, Blackstone, Milbourne Christopher, Gibson, Kreskin, David Copperfield, and Randi to name but a few.

Schiffman comprehensively instructs us in how illusions are created and what things to look for when watching magicians in action. He also discusses the foundations of deception—including misdirection, control, the use of gimmicks and fakes, lying, and concealment on stage. Along the way Schiffman talks about how the skilled magician uses manipulation, substitution, duplication, camouflage, imitation, false partitions, concealed mechanisms, falsification arrangements, and so on to create his illusions. When the magician performs his illusion he is required to simultaneously do three things: tell the story of the effect he is creating; manipulate the secret mechanisms or ploys that provide the "magic," and create proofs or clues that mislead and show that nothing false or "hokey" is occurring.

In the second section Schiffman examines magic from an on-stage perspective and from the point of view of a magician on stage. We are told everything we need to think about as a magician and the necessity of controlling as many aspects of the "theater setting" as possible. In other words, the magician has to orchestrate his control over the audience by giving them suggestions, controlling his every movement, using pantomime, sound, and music, carefully developing his patter and pacing, and—in a sense—*brainwashing* his viewers through his use of lighting, audience participation, and clever acting.

In part three he considers magic from the points of view of the audience, the assistants, and his animal helpers. He also sneaks into the magician's trunks to look at all of the tools, props, and gadgets that one sees on stage but is never allowed to touch or inspect. As we go through these things the secrets of dozens of standard illusions are revealed.

In part four Schiffman does something most unusual: he looks at how magic tricks and techniques can be taken out of the theater and applied in the real world to manipulate and influence others. We also learn what we can do to protect ourselves from such chicanery. This section is of particular interest to skeptics since it deals with the use of fakery and how we can best go about detecting it and exposing it. Among the example given are some of Randi's techniques used to expose several faith healers, psychic surgery, Uri Geller's tricks, as well as numerous tricks used by some of the nation's best con artists. A particularly delightful chapter is one titled "Misdirection: Magic In Everyday Life." This is followed by another one that every shopper can profit from titled "Magic In Selling And Advertising."

Throughout the book, and in nearly every chapter, Schiffman tells us clearly and succinctly exactly how the magician's tricks are done. The secrets of the Floating Lady, the Indian Rope trick, numerous card tricks and sleights and forces, how large massive objects seem to disappear, how David Copperfield flies, and so on, are exposed. Although it would be impossible for Schiffman to explain in detail how *every* effect is achieved, the general

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principle behind the illusion is provided. This, to many professional magicians, is anathema. Yet both Henry Gordon in an excellent foreword and Schiffman in his preface provide a most persuasive defense of this practice. Gordon notes that books telling hobbyists how to perform particular tricks are putting the cart before the horse. They should be learning the basic principles of conjuring, such as misdirection, human perception, showmanship, and visual and psychological illusions. Schiffman provides all these things. Moreover, Gordon says, "I have never known of a professional magician who has had his or her career affected by revelations of this kind *when they appear in a book that has been purchased*. . . most people who are more interested in the entertainment of magic than in the solving of the secrets will forget the revelations over time." He also notes that "The secrets of conjuring will always be revealed. This serves two useful purposes. They promote an interest that recruits newcomers to this wonderful hobby, and they challenge performers to devise new and improved methods of deception."

Schiffman defends himself by emphasizing that all of the best books in magic break the rules and reveal some secrets. Moreover, after his book "you will never view a performance of magic the same way again." I heartily agree and, since Schiffman's book is about magic appreciation, "—the appreciation of the skills, sleights, and forethought that go into making a magical effect," I cannot believe that any professional would feel threatened by Schiffman's prolonged appreciation and praise.

The same cannot be said, however, about the Fox network's recent TV broadcasts "Magic's Biggest Secrets Revealed." In these telecasts (three I believe) numerous box escapes, sword platform escapes, underwater escapes, levitations, catching a bullet in the teeth, piercing a live subject with an arrow, and causing a tank and other massive objects to disappear were exposed and explained. Like many members of the TV audience, I had a fair idea of how the tricks were done but could not provide exact, detailed, and/or specific proof of any one method.

Back in the 1930s, Camel cigarettes ran an ad campaign in which magician's secrets were exposed. The series title was "It's fun to be fooled, but it's more fun to know!" Although I am no admirer of Joe Camel, in this case I think they hit the nail on the head. I could be wrong, but I believe Schiffman would agree.

Irreverent Magicians At It Again

PETER HUSTON

Penn and Teller's How to Play in Traffic. By Penn Jillette and Teller. Boulevard Books, New York. 1997. ISBN 1-57297-293-9. 227 pp. Softcover, $18.95.

As most readers know, Penn and Teller are a well-known pair of comedian/magicians who specialize in irreverent humor and bizarre, shocking, magical effects. This is their third book, following *Cruel Tricks for Dear Friends* and *How to Play with Your Food.* For better or worse, it shows little change or growth from their previous books, and it is safe to say that if you like them, you'll like their books. If you've never heard of them, and like cynical humor with a hip, skeptical tinge, then by all means make a point of finding out who these guys are. *How to Play in Traffic* is not a bad book, but it does lack some of the crispness and freshness of their previous books.

Successful entertainers often fall into a trap. Either they can reinvent themselves, and risk losing some of their audience, or they can repeat themselves, and risk seeming stale. This seems to be the challenge facing Penn and Teller, an act traditionally based on innovation and shock value. In parts of *How to Play in Traffic,* however, they don't quite seem to know how to deal with this challenge.

For instance, the book is laced with smug, in-your-face references to the Penn and Teller moral code. Briefly, this can be summed up as "Alcohol, drugs, censorship, and religion are very bad. Homosexuality is fine. Strip clubs, sex, pranks, and card tricks are very good." Unfortunately, if you don't subscribe to this dictum, or have heard it before, then it wears thin about halfway through the first time its thrown in your face, and this book is over two hundred pages long.

Despite this, the book does fulfill its promise of offering Penn and Teller fans more of their material. The authors tell stories about travel, magicians, and carnival life. They teach the reader magic tricks, and have conveniently categorized them by level of difficulty. Skeptics should enjoy several of these, including the portions of the book where the authors show how to create visions of the Virgin Mary with a polaroid camera. Unlike their previous books, this one does not include a "gimmicks bag" containing props for tricks, although it does have a one-page, clear plastic insert to be used for the purpose.

Penn and Teller frequently advocate skeptical thinking in their works. In this one, however, much of the skepticism is confined to attacks on Sir Arthur Conan Doyle and his spiritualism, or a thousand and one perverse uses for a Gideon bible. Perhaps promoting more constructive activities or pointing the reader toward resources they might not have heard of would be a better use of the pages. If you're a long-time Penn and Teller fan, you should like this. If you're not familiar with the pair, their earlier books might make a better introduction to their style and substance. □

Peter Huston writes from Schenectady, New York.

A Close Look at Multiple Chemical Sensitivity. **Stephen Barrett, M.D.** Quackwatch, Inc., P.O. Box 1747, Allentown, PA 18105. 1997. 63 pp. Softcover. $9.00. A booklet exposing what two national health advocacy groups—Quackwatch and the National Council Against Health Fraud—say are the "dubious practices" of doctors who promote "multiple chemical sensitivity" (MCS). Looks critically at MCS, its questionable diagnostic and treatment methods, and the network of physicians, lawyers, and others who benefit from promoting MCS.

***Frauds, Myths, and Mysteries: Science and Pseudoscience in Archaeology* (Third Edition). Kenneth L. Feder.** Mayfield Publishing Company, 1280 Villa Street, Mountain View, CA 94041. 1998. ISBN 0-7674-0459-9. 320 pp. Softcover. $20.95. Welcome new edition of this very readable book for students and laymen, which uses interesting archaeological hoaxes, myths, and mysteries to show how we can truly know things about the past through science. All the popular topics are here, and for the third edition Feder has written extensive updates and new material. Every chapter has a new Frequently Asked Questions section. Another new feature in each chapter is a short list of Web sites on the topic, titled Best of the Web.

Intellectual Impostures. **Alan Sokal and Jean Bricmont.** Profile Books Ltd., 62 Queen Anne Street, London W1M 9LA. 1998. ISBN 1-86197-074-9. 274 pp. Softcover. £9.99. The first English-language publication of the book that caused a storm in Paris last year when published in French. Subtitled "Postmodern Philosophers' Abuse of Science," physicists Sokal and Bricmont show that famous intellectuals have, as they say, "repeatedly abused scientific concepts and terminology" in their critique of science. The authors also dissect a number of confusions involved in epistemic relativism, the idea that modern science is nothing more than a "myth," a "narration," or a "social construction." Say the authors: "This book deals with mystification, deliberately obscure language, confused thinking, and the misuse of scientific concepts." (See also World Skeptics Congress section, this issue page 7.)

Making Sense of Astrology. **Ronny Martens and Tim Trachet.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1998. ISBN 1-57392-218-8. 276 pp. Hardcover. $23.95. Two prominent Belgian skeptics provide an objective overview of astrology. They trace its origins and evolution, analyze its mechanisms, and compare different astrological systems and schools. They then review astrology's major contentions side by side with factual, scientific knowledge about the universe.

UFO Sightings: The Evidence. **Robert Sheaffer.** Prometheus Books, 59 John Glenn Dr., Amherst, NY 14228-2197. 1998. ISBN 1-57392-213-7. 327 pp. Hardcover. $25.95. Sheaffer, a noted veteran skeptical investigator of UFO claims and SI's longtime "Psychic Vibrations" columnist, here provides a major update of his 1980 book *The UFO Verdict*, with new material on Roswell and other matters new since then. He speaks to the continuing lack of credibility of most UFO proponents and claims and the proliferating media programs that shamelessly promote them. He examines many classic UFO sightings, providing logical, factual explanations where proponents have found only unsolved mystery.

—Kendrick Frazier

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Concar, David. "Hypnosis: What Really Happens in Your Brain." *New Scientist,* July 4, 1998, pp. 26–31. Article about the controversy over hypnosis, balancing the views that it isn't or is a special state of consciousness.

Flam, Faye. "Call it Freedom? Or Beyond the Fringe?" *Philadelphia Inquirer,* August 31, 1998. Science reporter's article stimulated by Martin Gardner's column in September/October SI critical of Temple University's Center for Frontier Sciences. Flam talks to Temple mathematician John Allen Paulos and other faculty scientists who are equally critical of the center's uncritical excursions into deep fringe topics. ("It's been like the scandal of the lobotomized cousin up in the attic," says Paulos.) Others defend the center, but the article concludes that "rigorous skepticism" helps uphold the scientific method, breaks down old dogma, and unleashes the forces of scientific progress.

Hines, Terence. "Brief Communication: Further on Einstein's Brain." *Experimental Neurology,* 150: 343–344, 1998. A much-publicized 1985 histological study (M. Diamond, et al.) of the brain of Albert Einstein found a higher glial cell to neuron ratio than in control brains and suggested that this "might reflect the enhanced use of this tissue in the expression of his [Einstein's] unusual conceptual powers in comparison with control brains." Hines says the study apparently was never subjected to careful scrutiny. "When this is done, it becomes clear that the study is permeated with faulty methods and statistical analyses that render the conclusions drawn invalid."

Goodwin, Jan. "Doctors of Nature—*or Nonsense?*" *Good Housekeeping,* September 1998, pp. 98–101, 170–171. Excellent article about the practice of "unscientific medicine" that is too typical of naturopathy. Raises the question whether naturopaths, who treat patients with everything from color therapy to snake venom, may be doing more harm than good.

Hofstadter, Douglas R. "Popular Culture and the Threat to Rational Inquiry." *Science,* 281:512–513, July 24, 1998. Thoughtful, passionate essay about how young people brought up today on TV (even the "sugar-coated science television shows") and popular culture miss out entirely on the "sense of mystery" that "lies at the core of science . . . the feelings of awe and strangeness that one has when confronted with inconceivables . . . ." Hofstadter laments that a "reverence for the laws of nature" and a sense of awe and mystery have been replaced by a "deep, unconscious, anti-science bias" in society that views science as mundane, while those who invoke ESP, UFOs, or "any of a thousand other varieties of alleged paranormal phenomena" are viewed as "open-minded."

Larson, Edward J., and Larry Witham. "Leading Scientists Still Reject God." *Nature,* 394:313, July 23, 1998. Survey of views of "greater" scientists (those who are members of the National Academy of Sciences) toward religion found "near universal rejection of the transcendent" by NAS natural scientists. Disbelief in God and immortality among NAS biological scientists was 65.2 percent and 69.0 percent respectively, and among NAS physical scientists it was 79.0 percent and 76.3 percent. "Among the top natural scientists, disbelief is greater than ever—almost total," conclude the authors.

—Kendrick Frazier

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   Simon Conway Morris; Oxford University Press
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   Robert Eastaway and Jeremy Wyndham; Robson Books
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Who is the Cat That Curiosity Killed?

ELIZABETH LOFTUS

In July, psychologist Elizabeth Loftus traveled to the University of Portsmouth, England, where she received an Honorary Doctorate of Science, and delivered this speech at commencement.

Speakers at university graduations give all kinds of advice. Where do they come up with it? Often they borrow from others and come up with something like "Always do right." This bit came from Mark Twain, who went on to explain that by following this advice you "will gratify some people and astonish the rest." Or, I once heard the advice, "Make yourself necessary to somebody." This came from Ralph Waldo Emerson. Now, I have nothing against such advice, coming as it has from two individuals who have made such lasting contributions to the world's culture. But is their advice practical? Is it memorable? Is it the one thing you'd like to say to new graduates, their families and friends?

Today, I'm going to leave you with one piece of advice, and, as a specialist in the area of memory, with a way of remembering that advice. You'll see that it's advice about a cat. Not just any cat, but a particular cat—the cat that curiosity killed. I'll come back to the curiosity cat, but first, how I got to that advice to begin with. . . .

I began my studies at the University of California in Los Angeles in the 1960s—a period of unrest and turbulence. When I started university, America had 80 million fewer people than it has today. I was also going to tell you that the music stores at that time had yet to stock a Beatles' album, but my advisors said that you wouldn't be very interested in that fact, and instead I should mention that it was before there were any Spice Girls CDs. I had no idea what I wanted to do in life. It was about the same time that one of our modern American heroes, John Glenn Jr., made being an astronaut seem like a good career. He had just orbited three times around the earth, travelling about 81,000 miles in five hours, before he splashed into the Atlantic Ocean. He was the first American to make such a flight. He made being an astronaut seem like fun—but there didn't seem to be any girl astronauts, so maybe that wasn't for me. I considered the possibility of becoming a mathematics teacher and briefly flirted with the idea of being a private detective or a stockbroker.

I spent a lot of time at university with my two best friends, Diana and Caron, going to these Friday night things called "Beer Busts." We spent way too much time drinking beer, flirting with the fraternity boys, and crying on each other's shoulders when one of them broke up with us. Things happened during those years that made me feel terrible, like the assassination of our president, John F. Kennedy.

And then I discovered psychology. It happened in an introductory psychology course, after which I gobbled up all the psychology that I could. Even after that I still wasn't quite sure what I would do with all that psychology. In fact, I left university into a world still full of unknowns, and headed north to graduate school. My brother David drove me those 400 miles to Stanford. When he dropped me off, I started sobbing—it was the first time that I would be living away from home and I was scared to death.

At the same time, there was brewing excitement . . . . All I knew for sure was that I was going to study more psychology.

When I think back to those years, it is clear to me that one of the biggest impacts on my life revolved around my growing understanding of science—or, in my case (and the case of many of you here), psychological science. From my professors, and textbooks, and study groups with fellow students, I learned that science is not just a huge bowl of facts to remember. Science is a way of

Elizabeth Loftus is professor of psychology at the University of Washington in Seattle and is currently president of the American Psychological Society. Her books include Eyewitness Testimony *and* The Myth of Repressed Memory. *A Fellow of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), she was recipient in 1994 of CSICOP's* In Praise of Reason *Award.*

thinking. It's a process. In an article in a recent issue of the *New Yorker* that I read on the plane coming to England, one writer put it much more aptly: Science is based on a fundamental insight—that the degree to which an idea seems true has nothing to do with whether it is true, and the way to distinguish factual ideas from false ones is to test them by experiment.

Well, I learned rather well how to test ideas by experiment and applied that knowledge to one particular subject matter—human memory. Over the years I've conducted hundreds of experiments, and learned some pretty nifty things about the workings of the human mind. Discovering some fundamental facts about the malleability of memory has been a most exciting thing to do.

But the study of psychology also gave me a way of thinking about the ideas of other people. About twenty years ago, when the psychology books were telling us that memory is permanent, that once something is seen or heard and goes into memory, it stays there forever, I wondered "How do they know that? What's their evidence?" And I dug up the so-called evidence and investigated it as thoroughly as I could. I discovered it wasn't evidence at all.

You don't need to be a practicing psychological scientist to pick up some of these skills. Whether you go on to become a police officer or a private investigator, a therapist or a teacher, a playwright or a physicist, a geologist or a geographer, a software engineer or a statistician, it's possible to make use of one important gift that the study of psychological science has given to many of us. That is the gift of knowing how to ask the right questions about any claim that someone might try to foist upon you.

The first important question, in my mind, is three or four words long: "What is the evidence?"

When someone tries to tell you that:

- Your astrological sign determines your personality . . . or
- Aliens are arriving in UFOs and abducting people, or
- Coffee is bad for you, or
- Satanic ritual abuse is rampant, or
- Tenure is bad for the university . . .

. . . It should be almost automatic to ask, "What's the evidence?" Now, let me emphasize that, in using these particular examples, I'm not trying to suggest that they are all examples of what the evolutionary biologist Richard Dawkins has called "pernicious rubbish on an almost astrological scale." I'm only suggesting that it should be almost automatic to ask about any idea, "What's the evidence?"

Now, as psychologists we don't stop there. We can get even more specific about what we ask next:

- What kind of study was done?
- What was the dependent variable?
- Was there a control group?
- What kinds of statistical tests were used to analyze the data?
- Has the study been replicated?

What we're really asking here is question Number Two: "What *exactly* is the evidence?"

Some evidence is so flimsy or fragile that it is not really evidence at all. For example, as I and others have shown, some kinds of eyewitness testimony is so fraught with the probability of error that it is not really evidence at all, and to consider it so can sometimes lead to grave miscarriages of justice.

So these questions about evidence are valuable to be asking over and over in life.

There is a wonderful cartoon that appeared recently in *Parade* magazine, a magazine that reaches some 80 million people in America. And here's where we get to that cat. Picture this: Mother and little Son are sitting at the kitchen table. Apparently Mom has just chided Son for his excessive curiosity. The Son rises up and barks back:

"Curiosity killed what cat?
What was it curious about?
What color was it?
Did it have a name?
How old was it?"

I particularly like that last question. Maybe the cat was very old, and died of old age, and curiosity had nothing to do with it at all.

So in closing, I remind you that speakers at university graduations give advice freely:

Go forth.
Always do right.
Be true to yourself.
Make yourself necessary to somebody.
Wear sunscreen.

It's all good, but, my pick for the one advice morsel to suggest to you is simple. Remember to ask the questions that good psychological scientists have learned to ask: "What's the evidence?" and then "What *exactly* is the evidence?" And if you forget these questions, then just try asking for the name or the age of the cat that curiosity killed.

From the Anthropic Principle to the Supernatural

DAVID A. SHOTWELL

Thomas Aquinas was not content to base religion upon faith, but gave purported proofs of God's existence. These have been elaborated upon by theologians and metaphysicians, and a number of apologists have attempted to enlist science itself in support of supernaturalism. An example is provided by Patrick Glynn in his recent book *God: The Evidence.* I will comment upon some of his claims but leave to others the analysis of his appeal to "near-death experiences" as evidence for immortality.

Glynn is very confident. Five hun-

dred years after the birth of Copernicus, he says, we have witnessed the philosophical overthrow of the Copernican revolution: Although scientists assumed naïvely that humans are not the favorites of the universe and that it does not exist for our benefit, they now know, or should know, better. The initial step toward that conclusion was taken by the cosmologist Brandon Carter, who introduced his "anthropic principle" in 1973. It is summarized by Glynn in the statement that the laws of nature are precisely those needed to provide a universe capable of producing life. Because life does exist, this supposedly explains why the laws and constants of physics are as they are. If they were not, we would not be here; but we are here. This is said to be a bold new type of explanation. Glynn uses it as a first step toward a leap of faith, upon which he elaborates at length: The laws of physics are the work of an intelligent Creator, whose objective was to produce human beings.

Why human beings? It is easy to think of alternatives. Perhaps the Creator, if there is one, really wanted to produce dinosaurs, and we are an unimportant byproduct of the enterprise. It might be objected that dinosaurs are, after all, extinct. That is true enough, but does anyone think that we will be here forever? If we last one tenth as long as did the dinosaurs it will be an impressive achievement.

I do not insist upon dinosaurs. Instead, I would put my money on insects, the most successful of all life forms. The total number of them is somewhere in the trillions, as compared with only a few billion humans. The entomologic principle, newly formulated by me, states that the Creator had insects in mind all along, and fine-tuned his laws to produce them. Why, you may ask, would he want to create insects? I am sure that I don't know. But I also don't know why he would want to create humans.

The concept of randomness is misinterpreted by Glynn. He refers to the "random universe cosmology" that underlies atheistic philosophies, attributes to scientists the view that randomness engenders order, and says that you cannot explain away the order in nature by reference to a purely random process. These statements make it clear that for Glynn a random event or process is simply one that is not produced by an intelligent agent. His argument therefore reduces to the question-begging assertion that orderly structures and processes must be the work of such an agent because they could not occur otherwise. That is the essence of the traditional argument to design, which does not depend upon the anthropic principle.

Scientists do not explain, or explain away, the order of nature by invoking pure randomness. With the possible exception of submicroscopic processes subject to quantum mechanical indeterminacy, they believe instead that events occur in accordance with natural laws. When a liquid solidifies to form crystals, the crystals have an orderly structure, and neither the structure nor the process is a random one; it is a result of the laws of physics. An unlimited number of other examples could be given. Glynn would reply that the laws themselves have not been explained. In many cases, however, they have been; the reduction of thermodynamics to statistical mechanics is the standard example. This, of course, is not what he is demanding. Science, he says, must surrender its pretension to answer the ultimate questions, and reason is an imperfect guide to ultimate truths. He implies, therefore, that when reason has taken us part of the way we should abandon it and rely upon unreason. It will lead us on to God, whose creative activities provide the answers to ultimate questions, in particular those concerning the existence of the universe and its laws.

I have a rival hypothesis to propose. Let us assume that each subatomic particle is inhabited by a ghostly little gremlin. Each gremlin maintains the existence of its particle by a continuous creative act and is in instantaneous telepathic communication with all of the others. By this means they cooperate to produce the universe and its lawful behavior. This hypothesis "explains" everything that exists and every event that occurs. It accounts for those nasty features of the world that are so troublesome to believers in an omnipotent and perfectly benevolent creator; they exist because the gremlins are mischievous and, in some respects, malevolent.

I advance this "theory" not to make a joke, but to make a point. If you admit the supernatural into your calculations, anything goes. That is why a supernatural explanation is useless to a scientist, however pious he may be on Sundays. It provides no direction for research, suggests no testable hypotheses, and gives no reason to expect one result rather than another from any observation or experiment.

Questions such as "Why does the universe exist?" and "Why does it follow one set of laws rather than another?" are regarded by Glynn as ultimate. Magic, personified in God, is his answer. But irreverent critics can reply by asking how an immaterial agent created matter, how he controls its behavior, and why he exists rather than nothing at all. The only answer we are given is, in effect, that the supernatural is beyond human comprehension. Mysteries, however, are not explanations, and it appears that only theologians and their allies are licensed to pretend that they are. □

A supernatural explanation is useless to a scientist, however pious he may be on Sundays. It provides no direction for research and suggests no testable hypotheses.

David A. Shotwell has taught mathematics at the Colorado School of Mines, San Diego State University, and Sul Ross State University in Alpine, Texas, where he is now retired.

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Seeds of Doubt?

Elie A. Shneour's essay on the proper business of CSICOP ("Planting a Seed of Doubt," July/August 1998) reminded me of the late Carl Sagan.

On one occasion, I was watching live television coverage of the Jet Propulsion Laboratory as pictures started to arrive from a distant space probe. I can't recall the specifics, but the images were startling and unexpected—along the lines of the braided rings of Saturn. The air was filled with speculation, and one young astronomer in particular was enthusiastically advancing the first bright idea that had occurred to him as a possible explanation. Sagan listened calmly and then remarked "Perhaps."

It was a wonderful response, for three reasons. It acknowledged that the enthusiastic speculator might be on to something. It also recognized that they should all continue searching for other potential hypotheses. And it reminded everyone that the bottom line was still a requirement for a showing of fact.

In his book *Pale Blue Dot,* which I had the pleasure of listening to as a recorded book, mainly narrated by Sagan himself, he would frequently set forth all the findings in a particular area, then lay out a closely reasoned line of thought as to where they seemed to be leading. And he would invariably conclude "But . . . I might be wrong."

If an acknowledged expert like Sagan—a world-class authority on planetary science—regularly acknowledged his fallibility in his own area of expertise, it sets a standard for everyone else. Before we go about planting seeds of doubt in others, it behooves us to grow a healthy crop of it for ourselves.

Richard S. Russell
Madison, Wisc.

Elie Shneour is right in stating that the goal of the skeptic is to plant a seed of doubt. The presence of doubt is the difference between scientific thinking and magical thinking. Scientific inquiry is driven by doubt. Magical thinking is based on certainty, doubt is not allowed. Any magician will tell you that the presence of doubt or "unbelief" will weaken or destroy a spell.

But in dealing with students raised on New Age magical thinking, "The X-Files," and the like, planting that seed is by no means easy. In teaching at a school for massage therapists, I have been faced with myriad examples of magical thinking in students committed to alternative health care. The most common alternative therapies that I hear enthused about are polarity, reflexology, cranio-sacral therapy, and homeopathy. As has been pointed out at great length in these pages, none of these therapies has any scientific basis, and none has survived a well-designed double-blind clinical trial. Yet they continue to be extremely popular with many massage students. I have been told of miraculous cures wrought by these methods; cures that they have experienced as clients or have performed as therapists.

After some twenty years, I've come up with some simple rules for planting that all-important seed of doubt:

1. Don't deny the experience. It is too easy to pass it off with such phrases as "That's not what really happened" or "Well, if you think it works, it works" or the ever-popular "That's the stupidest thing I ever heard!" Remember that if someone is convinced that an experience was real, denial will just turn them away.

2. Don't put forward a "scientific" explanation. In fact, don't try to explain anything.

3. Get the student on your side without agreeing with what they claim: "I'm really glad that it worked for you, but keep in mind that people are very different." "Are you absolutely certain that what worked for you will work that way for someone else?"

4. Ask lots of questions. Show a real interest and get as much specific information as you can about what actually happened. Ask for a step-by-step description of the physical process.

5. Get past the jargon. Ask for definitions in simple terms. "Exactly what are chakras, meridians, etc?" "What do you mean by balancing the energies or fluffing the aura?" This process in itself will often get the student wondering if he or she really knows how a particular treatment works.

6. Ask for any documentation or written material on the subject, and look at it with the student. In a few cases I have been able to sit down with a student and go over the written material point by point. At the end the student was much less sure about the therapy or diet or device than they were earlier.

7. Don't get discouraged. Many people are deeply dependent on magical thinking, and to try to wean them from it is difficult and not always successful the first time.

To introduce doubt is a direct challenge to magical thinking and it has to be done carefully, and with compassion. After all, the most difficult thing in the world for any of us is to let go of our certainties. We are subversives, operating as gently and a subtly as we can.

Kenneth R. Morgareidge
Arvada, Colo.

Farmers never plant seeds in clay. Yet, Elie A. Shneour's article "Planting a Seed of Doubt" advocates that enlightened minds should "devote more time to the uninformed collectivity, and decrease the time speaking to ourselves." And, to advance civilization, CSICOP members should "plant a seed of doubt" in the minds of the uninformed to promote education and critical thinking.

History has recorded that within every society, both present and past, there are a few thinkers who have helped advance the cumulative knowledge of previous generations in science and the arts. The overwhelming majority of people have, historically, served as stumbling blocks along the path of knowledge and have been quite content to blissfully inhabit their "demon-haunted world."

Is it pessimistic to be aware that intelligent people have always been an aberration, rather than the norm, in human populations and that trying to enlighten the masses beyond a basic conventional level is as futile as planting seeds in clay? To plant a seed of doubt requires a person who is 1) capable of listening, 2) of being able to assimilate new and challenging information in a rational and intelligent way, and 3) willing to abandon previously held beliefs to embrace new knowledge.

We know there have always been those in society who have been able to escape the dark world of ignorance, but we must not delude ourselves with political correctness and fashionable pseudo-philosophy to believe that all people are capable of this journey. Perhaps the best course of action for a CSICOP member is to help advance civilization not as a doctrinaire missionary, but rather as a traveler along the path of personal enlightenment.

Ron Schultz
Marengo, Ill.

Science and Truth

The answer to Ralph Estling's title ("Is Science Concerned with Truth?" SI July/August 1998) is yes. Estling should have defined his "truth." The flaps between his scientists, relativists, and fanatics would evaporate had he obeyed Socrates and defined his terms. Here's one of the things I talk about on the first day of class when everybody shows up but no one has cracked the book. When religious versus scientific truth are defined, even the most fervent fundamentalist is quieted (if not slowed down)

as we proceed through geologic time, evolution, and the nebular hypothesis for the origin of the solar system.

A truth is not a fact. Facts are scalar entities that all sane people can agree on. Truths are relationships between facts (like a resultant in vector analysis). "True" is used in science when a valid relationship is established between facts; "false" when it is not. That smoking can cause cancer is true; that smoking causes the tides to rise is false.

It's unfortunate that the words "truth" and "true" are used in both science and religion. Religious truth is revealed by God and conveyed by his prophets or enshrined in sacred scriptures. Unlike scientific truth, religious truth cannot be challenged (by the faithful) because it is accepted on faith. Faith, by definition, is the acceptance of truth without testing nor the possibility of falsification.

Political truths are much like religious truths but are based on ethical values instead of faith. This is why politics and religion are common bedfellows. When politics and science are united, either the movement fails due to an excess of naïvete, or the science becomes corrupt (Lysenko's genetics in Communist U.S.S.R.; eugenics in Nazi Germany).

And is science ". . . a new religion and scientists its high priests"? Define religion!

John C. Holden
Alternate Sources of Entropy
Omak, Wash.

Practicing scientists talk about observations, measurements, facts, hypotheses and theories, none of which are identical with Estling's long lamented Truths. Scientists worth their salt keep a respectful distance from such absolutes as "truths" and "perfect" owing to the mutilation such words receive when bandied about in learned essays similar to the one in question.

Scientists may very well believe the truth is safe and healthy out there but they simply cannot quiet that little voice in their heads that keeps stubbornly asking, "How do we know we are properly equipped to recognize the absolute truth perchance we should fall upon it?" Dwelling too long upon such questions of overanalysis can easily lead to paralysis, as the poor centipede discovered when he tried to locate the pair of legs he moved first in order to walk. While science critics pull the hair from their armpits in desperation over scientific neglect of the truth, the best scientists decide to work without the perfect tools essential to establishing the truth and, believe it or not, thereby advance the cause of useful knowledge.

To put it in baby-talk: Scientists try to reconcile their percepts with their concepts. As our perceptions sharpen, aided by advancing technologies, we adjust our concepts of the world from a flat stationary Earth inside a rotating celestial spherical shell to a round rotating Earth moving about the sun in a totally restless universe. On and on the theories go, constantly changing but never without a fairly democratic consensus; not without a large number of careful observations by a large number of trained observers.

The situation is far more deplorable than the one of concern to Estling. Not only should we avoid indiscriminate use of words such as "truth" but we should give up trying to understand anything excepting possibly messages from other people. My late physics professor, Dr. A.A. Knowlton, explained this when one of his students complained that she didn't understand electricity. "I don't either!" he screamed. "Electricity is electricity and cannot be explained in terms of anything else. Now get into the laboratory and become thoroughly familiar with the relationships of voltage, current, and resistance. Your examination next week will test your familiarity with those relationships not your understanding of them, never fear. Do you understand?"

Bernard Smith
Boca Raton, Fla.

It is laudable that Ralph Estling defends the view that truth plays a prominent role in science. However, in so doing, he espouses a notion of truth that is inadequate. Indeed, Estling says that truth is what is out there. Thus, he conflates truth with the facts out there, with reality. The very word "truth," then, would be redundant. Of course, scientists are (or at least should be) concerned with reality. But if truth were the same as reality out there, then scientific hypotheses and theories could not be said to be true, for they simply are not out there, but "in here"—in our heads. And it is precisely our hypotheses and theories about reality which we want to be true. Thus, truth is an attribute of statements and theories, not a property of the world. Now, when is a piece of knowledge true? If, and only if, it corresponds to reality, if it matches the facts out there. This notion of truth is known as the correspondence theory of truth, and it is this concept of truth that Estling should have defended against its conventionalist, hence relativist, alternatives. It is, therefore, regrettable that he seems to have misunderstood the philosopher Alfred Tarski, who at least attempted to elucidate the notion of correspondence truth. Whether or not one regards Tarski's analysis as satisfactory, Estling's view is definitely not a viable alternative.

Martin Mahner
Berlin, Germany

From Essiac to 'X-Files'

Perhaps it's because I've turned fifty, but I find myself beginning more and more of my sentences with the phrase "I remember." Two of the articles in the July/August issue inspire in me more than the usual amount of nostalgia, both for long-ago events and for those which occurred more recently.

The article by Lynn McCutcheon on René Caisse and Essiac reminded me of a well-known Canadian talk-show host of the 1960s and 1970s named Pat Burns. Burns, who called his show "The Hot Line" and claimed to have copyrighted the term, revelled in controversy in many fields, including health care, and promoted a number of dubious cancer treatments in addition to Essiac, including laetrile and Krebiozen. I believe, in fact, that after Caisse's death, Elaine Alexander, who produced Burn's program, acquired the rights to Essiac. Both she and Burns are now deceased, so I had no idea what had happened to Essiac. Until McCutcheon's article jogged my memory, I thought it had been consigned to the dustbin that is already piled high with other discredited "cures."

The other article that sparked memories, both long-ago and more recent, is Glenn Spark's article "Paranormal Depictions in the Media: How Do The Affect What People Believe?" William Davis, the "Cigarette-Smoking Man" from *The X-Files* and a lifelong skeptic about paranormal phenomena, recently spoke at a BC Skeptics' gathering. He didn't seem to think that shows such as *The X-Files* influence public beliefs. But I pointed out to him during the question period that some programs go to great lengths to convince viewers of the possible veracity of what they depict. I cited the example of a program that I remember (there's that phrase again!) from the 1960s, *The Man from U.N.C.L.E.*, starring Robert Vaughn. According to the program's credits, U.N.C.L.E. stood for the United Network

Command for Law and Enforcement, and a note in the credits thanked this organization "without whose cooperation this program would not have been possible." Of course, there was no such organization, so the producers obviously used this note to give credibility to the program. How much more credibility, I asked him, does the fact that the FBI actually exists give to *The X-Files*? Mr. Davis conceded that I had a point, though he still contended that he didn't know to what extent this affected viewers' belief that "the truth is out there."

To paraphrase an old chestnut about sincerity in the acting profession, in television, if you can fake verisimilitude, you've got it made.

Barbara-Anne Eddy
Vancouver, B.C.
Canada

Surveys and Students

The article by Glenn Sparks ("Paranormal Depictions in the Media" July/August 1998) bought back memories almost forty years old. As a college student, I was once the subject of a few experiments like Sparks describes. Participating was a requirement for a psychology class. I resented being drafted, and didn't feel a moral obligation to give it my best effort.

As in three out of four of the experiments Sparks describes, it was often possible to guess what the experimenter was after. No doubt some people did their best to ignore their guess, some told the experimenter what he wanted to hear, and some had a perverse streak and told him the opposite. (I did that once, when the experimenter insulted my intelligence with his clumsy attempts to disguise what he was after.)

It seems to be an article of faith among people who do these experiments that the effects I am talking about are small. (In Sparks's case, I believe the different reactions to *details* about the UFO articles are real. In that case, the subject couldn't know what Sparks was after.) As articles of faith go, it does beat therapeutic touches.

As for the phone survey Sparks describes, correlation says nothing about causality. Personally, I don't watch *Unsolved Mysteries* and the like because I don't believe in paranormal phenomena, not the other way around.

Richard Brandshaft
Vancouver, Wash.

The Top Ten Hoaxes

I hate to say it, but CSICOP may have gotten one thing wrong about the "Ten Greatest Hoaxes" (News & Comment, July/August). Not only did King Tut's Curse not exist, it worked! Yes, every researcher who entered that tomb seventy-five years ago has since died!

John R. Cole
CSICOP Fellow
Oakland, Calif.

The *Protocols of the Elders of Zion* is the most cruel and enduring hoax. "The most deadly hoax ever conceived," the late Gordon Stein wrote (*Encyclopedia of Hoaxes*, 1993).

This evil forgery documented an international Jewish conspiracy against the world. Concocted by the Tsarist secret police, it was first published by a paranoid mystic. Before 1919 it helped kill 100,000 Jews in White pogroms. Though exposed as forgery in 1921, it was vigorously distributed by Henry Ford under the title *The International Jew*. Ford's paper claimed that, hoax or not, the *Protocols* described reality. Hitler's *Mein Kampf* parroted this 'Ford tactic' and parts of the *Protocols* as well. Ford recanted (1927), but the Nazis pushed the *Protocols* wherever they could. The Holocaust was fanned by this document. It convinced many decent German citizens that Jews were vermin.

The *Protocols* endure. Since 1990 more than thirty editions have appeared in the U.S.A. alone. They are sold by racists, by member of the militia movement and by Holocaust deniers. UFO conspiracy buff Cooper included them in his book *Behold a Pale Horse*. Parts were quoted in a handbook of the Aum Shinrikyo sect of subway nerve gas fame. Palestinian terrorists carry the *Protocols* as amulets. The *Protocols* aren't weaved into top-grossing fiction, but they are evil and, given human credulity as it is, dangerous. They kill.

Jan Willem Nienhuys
Waalre, The Netherlands

Monsters of Doom?

I enjoyed Martin Gardner's essay (July/August SI) on Earth impacts in science fiction (although I scarcely agree with his assessment of *When Worlds Collide* as "low-level pulp fiction with little hard science to redeem it"). I'd like to add the title of a remarkable little book to his list of early Earth-impact stories: 1916's "The Moon Maker," written by lawyer/novelist Arthur Train and physicist Robert Williams Wood. The story, originally serialized in *Cosmopolitan* (when that magazine was a very different publication than it is today), concerns the imminent collision with Earth of 150-mile-wide asteroid Medusa. A uranium-fueled nuclear spacecraft (its engine produces a stream of superheated helium) is launched to rendezvous with the intruder. Once near the asteroid, the astronauts create a small nuclear reaction on the surface which creates just enough thrust to deflect the body very slightly from its original path—but enough for it to eventually miss Earth. This short novel is interesting for a number of reasons, not the least of which is its extremely accurate description of spaceflight. Additionally, it features one of the earliest nuclear-powered spacecraft in or out of fiction (Garrett Serviss's "A Columbus of Space" predates it by six years), a working female astronaut (as opposed to someone just along for the ride), and apparently one of the first discussions anywhere not only of the possibility of an asteroid impacting the earth but of a realistic response to that danger.

Ron Miller
King George, Va.

Gardner's description of Brian Marsden's actions surrounding asteroid 1997 XF11 (misspelled 1977 XF11 in the article; it was discovered by Jim Scotti in December, 1997) may have left the impression of Marsden being a bumbling, attention-craving scientist who spread a misguided message of doom far and wide without thorough checking, and "humbly" apologized the next day when his error was exposed by others. Similar views were implied by the articles in *Time* and *Newsweek* that Gardner quotes as references. These views of the matter are quite misguided.

Some astronomical phenomena require immediate attention, either because their newly discovered interesting part lasts only a short time, or because they pose a potential threat to Earth. When such a case is discovered, the available information must be quickly passed on to other astronomers so that they can try to get more observations. A central collection and redistribution agency is the most efficient way of doing this. Brian Marsden has for more than twenty years been at the center of such an agency, which works under the auspices of the

International Astronomical Union (the worldwide organization of professional astronomers) and which publishes the IAU circulars for this purpose.

The orbit calculated for asteroid 1997 XF11 from the limited set of observations that was originally available indicated a very close passage and a potential hazard to Earth. This was clearly a case where more observations were needed, so Marsden included 1997 XF11 as a topic in an IAU circular. In response to this request for more observations, Eleanor Helin sent previously unrecognized observations of the asteroid. With this additional data a more accurate orbit could be calculated, which indicated a much greater miss distance. Brian Marsden published the updated results in another IAU circular the very next day after the first one.

The language in these circulars is to the point. The first circular explicitly states that predicted positions of the asteroid are given "in the hope that further observations will allow refinement of the 2028 miss distance." Even though Marsden wrote that passage within a distance shorter than that to the Moon "is virtually certain," this was not a message of doom, but a call to fellow-astronomers to provide more data so an uncertain result could be refined. The second circular mentions original miss-distance calculations from three other individual or groups of astronomers, which are very similar to the value published by Marsden . . .

Many of the journalists and others who reported on this asteroid seem to have little or no grasp of an essential point of science: Any scientist knows or should know that all measurements come with some amount of uncertainty, and that predictions based on measurements are likewise uncertain to some extent. A key question in assessing the risk posed to the Earth by asteroid 1997 XF11 is: How great is the uncertainty in the calculated miss distance? Neither the initial circular nor the second one listed error estimates, but the initial circular in particular did give a number of clues that there was uncertainty. None of the media reports I have seen addressed this question.

Many of the journalists also seem not to have taken into account the nature of the publication which lay at the ultimate basis of their reports. IAU circulars are written for an audience of astronomers, not for the general media. They assume in their readership a certain common store of knowledge about how astronomical observing works, and about what the role of the IAU circulars is in that process. Anything published in the IAU circulars is implicitly a call for more observations, and therefore preliminary. The IAU circular that started the controversy was not intended to inform the world of the likelihood of Earth being hit by an asteroid, but to spur astronomers into finding more observations so the orbit could be more accurately determined. Estimates of the uncertainty are essential for the former, but not important for the latter purpose . . .

In hindsight, it would have been better in this case if explicit estimates of the uncertainty of the quoted miss distances had been included in the IAU circulars, but perhaps it would have made no difference, seeing how the media—even supposedly serious media—tend to put the most dramatic spin on any situation.

Marsden did his job, but many journalists did not. These journalists portrayed Marsden (apparently without asking him for a reaction) as miscalculating the asteroid's path and scaring all of us without cause, but a study of the published documents shows otherwise. . . .

Louis H. Strous
Big Bear Solar Observatory
Big Bear City, Calif.

In Martin Gardner's otherwise fair coverage of the NEO impact hazard, he says, regarding the 1997 XF11 affair, "The next day, . . . Marsden was humbly apologizing," and goes on to explain that images of the object taken in 1990 proved that the object would not strike the Earth in 2028. If that were the case that the 1990 observations "saved us," Marsden would have nothing to apologize for, since he never claimed that a collision in 2028 was certain, or even likely. In fact, as Marsden himself admits in IAU circular 6879, issued April 18, it was possible (with a correct analysis) to rule out a collision in 2028 with even less than the eighty-eight days of observations available before he made his announcement on March 11. Now that would seem more like something to apologize for, but as far as I know Brian Marsden has not been "humbly apologizing," the next day or any other day since.

Alan Harris
La Cañada, Calif.

Magnetism and Bioeffects

Your article "Magnetic Therapy: Plausible Attraction" (July/August 1998) points out that there has been a lot of quackery associated with magnetism. However, there is something there which should be investigated carefully. It is easy to demonstrate that magnetism does in fact have biological effects.

My daughter did a high school science project that involved growing common aquarium algae in petri dishes over a series of successively stronger magnets. Moderate field strengths caused visible variations in algae growth patterns. We used a sheet of a magnetic field detector to see where the fields were; this is available in the Edmund Scientific catalog. The very strongest field appeared to completely disrupt normal algae growth, and microscopic examination showed no intact cells.

Of course, this experiment should be redone more carefully, but I would be curious to know just how the strong magnetic field was able to disrupt the algae so thoroughly. If this effect can be verified, it would suggest that people should be cautious about wearing strong magnets for extended periods of time.

Jim Byrd
Cambridge, Mass.

Emperor's Clothes . . .

The article "Science vs. 'Shroud Science'" (July/August) was excellent. I am a Christian, but I know that nonsense is nonsense no matter where it is found. These are the kinds of review (or investigative) articles concerning religious claims that I appreciate and the public needs.

Debating the fundamental philosophical issues concerning God is futile; neither theism or atheism can be proved or disproved. But specific physical events such as healings, crying pictures of the Virgin, bleeding Christs, demon possession, etc. are open to falsification. Go after them.

Robert J. Schier
robtshier@aol.com

2001: Dreams and Reality

Of the numerous reviews of my *HAL's Legacy: 2001's Computer as Dream and Reality*, Julia L. Green's in your July/August 1998 issue was the first to goad me into composing a reply—not because she makes factual errors, but because she overlooked several topics that are I'm confident, of great interest to CSICOP and the readership of SKEPTICAL INQUIRER.

First, a small matter: She is sad to read the book's dedication—"To Stanley Kubrick: *Ars sine scientia nihil est*" thinking somehow that the book elevates science at the expense of the arts. Nothing could be further from the truth. In fact this Latin epitaph comes from the Renaissance philosopher Master Jean Mignot, who was urging painters to study geometry, perspective, optics, color theory and so on, in order "get things right" in the service of greater art. No, Ms. Green, Jean was not levying some salvo in the Two Cultures War, three centuries before C. P. Snow; instead he was advocating the integration of reason and knowledge into the arts—one of the hallmarks of his era, but, alas, not one of ours.

This was a point stressed in my book and the reason for its dedication: to an extent unprecedented, and never duplicated in feature film, director Kubrick strove to be faithful to science and technology, known and anticipated. He went to extraordinary lengths to make space correctly silent, to use a spaceship design based on NASA technical reports rather than on underconstrained fancy, to show twenty-first-century videophones, voiceprint identification, and more as envisioned by scientists themselves. In those rare cases when Kubrick deviated from good science, he did so knowingly, but discretely, and always in the service of other, important artistic ends. In contrast, my book opens with a parody of the innumerable factual errors—impossible deafening booms, billowing smoke and sluggish, visible laser beams in the vacuum of outer space—that are staples of lesser science fiction films of that time (remember *Barbarella?*) and of ours (*Lost in Space* or *X-Files*), and which this journal frequently and quite rightly takes to task.

According to Arthur C. Clarke's 1968 novel *2001,* the HAL 9000 computer "became operational . . . On January 12, 1997," and hence now is the ideal time to compare the computer science vision put forth in the film with actual technical developments of the intervening thirty years. To this end my book considered key topics such as speech recognition, computer vision, emotions in computers and more. Ms. Green is incorrect, however, to state that in every case reality comes up short. In fact, as the book points out, several areas of computer science, including computer graphics, computer hardware, reliability, and others, have met or even surpassed the vision in the film. Even more interesting are the reasons that major trends—such as computers becoming *smaller,* not larger—were not foreseen.

While many best-selling books on technology look to the future (telling what will be on the road ahead), generally painting a rosy and wonderful world where problems like artificial intelligence, universal communication, and software upgrades are magically solved, my book takes a somewhat unusual tack: that of looking *backward* at careful, detailed and informed predictions. This helps to keep the futurists honest, much in the spirit of CSICOP's annual reckoning of the predictions of astrologers and psychics from the previous year. Unlike looking back on such "predictions," which generally lower our esteem of such "psychics," if *HAL's Legacy* is successful, it will give the reader new and deeper appreciation both for one of the greatest films of all time and for the technology that surrounds us now at the brink of its namesake year.

David G. Stork
Portola Valley, Calif.

Julia Green's review of the book *HAL's Legacy* prompts me to share an apparent urban legend I recently encountered online.

I heard the tale from a young man using the nickname JRG. Basically, JRG had turned around the famous origin of HAL's name, which is one letter off from the initials "IBM." In his version, the company IBM was named after HAL!

JRG was clueless enough to believe that Bill Gates owns IBM. He said, "When you consider HAL a metaphor for the murderer of the human race, you really have to wonder why Mr. Gates would deem his computers IBM . . . it's a little scary. He has admitted that's where the name came from. No joke."

I explained to JRG that Bill Gates has nothing whatever to do with IBM, and that the company International Business Machines, or IBM, predated HAL by decades, and that HAL was named after IBM rather than the other way around. His reply was a shrug, the equivalent of "Sure, okay, whatever." Want to bet he keeps telling this story to others?

Melanie Nickel
San Diego, Calif.

Not Even a Theory

The National Academy of Sciences' "Conceptions and Misconceptions" in your July/August issue loses its argument for teaching evolution and against the teaching of creationism by overstatement. The claim that, "in scientific terms, 'theory' does not mean 'guess' or 'hunch' as it does in everyday usage" is offered so as to make the scientific theory of evolution seem to be closer to certainty than any theory can be by definition.

The history of science reveals that scientific "theories," however firmly believed by practitioners, can be dead wrong. The Galen theory of blood "tides," the hypothesis of the existence of interstellar "ether," Newton's belief in absolute spatial locations, "phlogiston"—these were all scientific theories that turned out to have no foundation in reality. Actually, then, the labeling of evolution as a "theory" is a proper discipline's recognition of the possibility of error.

The real argument against teaching "creation science" would seem to lie in its inherent nature: It is not even a theory in *any* sense of the word. Rather, it is a rigid belief, accepted on faith, which rejects and seeks to invalidate all scientific discoveries that might refute it. As a creed, creationism certainly has a place in educational curricula, but in comparative religion classes, not biology labs.

Richard M. Biow
Winter Park, Fla.

Unpersuasive But Prototypical?

Unpersuasive but disturbingly prototypical is how I would describe ABC-TV senior science correspondent Dr. Michael Guillen's media-savvy responses (Letters, May/June, "GMA's 'Fringe or Frontier'") to Robert Park's (News and Comment, January/February) measured—"hyperbolic," according to Dr. Guillen—critique of Guillen's tacitly legitimizing foray into the fatuous (ESP, Mars effect) fringe.

Dr. Guillen's appeal to the authority of his audience, while rational as an oblique reference to the networks' need to generate ratings, is inadequate to counter Park's key criticism that the media shirk their responsibility to accurately inform their audience about matters of scientific controversy when they treat as open and credible what they know (or should know) is neither one nor the other. After all, even the Jerry Springer Show could defend the importance of the issues it covers using Dr. Guillen's yardstick of "the attention millions of people pay to them." Science, though public, is not democratic: audience appeal proves nothing.

Equally unconvincing is his attempt to deflect Park's concern that this approach

leads to "a disproportionate share of the science seen by the public (being) flawed" by claiming "ironically the vast majority of it comes straight from our refereed journals." His proof? "Many of today's research results dutifully carried by all our newspapers and newscasts are routinely contradicted by some subsequent study." That this may be more indicative of the media's rush to be first with the (supposedly) latest "breakthrough" (a Kuhnian paradigm shift around every corner) rather than any inherent flaw at the core of scientific method seems not to have occurred to Dr. Guillen. Scientific reasoning *is* ongoing and self-correcting; preliminary results *are* open to refinement, even refutation. But to equate this normal public process with flawed science is more suggestive of an *X-Files/Twilight Zone* interpretation of general scientific inquiry than methodologically flawed research. One wonders, moreover, why Dr. Guillen's "famous examples" of such research neglect two of the most egregious, namely, cold fusion and facilitated communication. Neither of which, irony of ironies, came "straight from our refereed journals" but rather a too-willing press, including ABC-TV (e.g., Diane Sawyer on *PrimeTime*)

Gary R. Juarez
Carignam, Quebec
Canada

Encouraging 'MPD' Behavior

Many thanks for publishing "Multiple Personality Disorder: Witchcraft Survives in the Twentieth Century (May/June 1998)." It reminded me of a time when I was assigned to a psychiatric inpatient unit here in Denver. We saw and treated a variety of general psychiatric problems ranging from disturbed personality disorder, bipolar disorder and the variety of schizophrenic disorders. Over a period of about ten years, we did not have one case of MPD. Then, a psychiatry resident, who devoutly believed in that diagnosis, became attached to the ward.

To everyone's astonishment, he found many cases, and sure enough, the different personalities became obvious to us all. I recall walking down the corridor with a young man who suddenly shouted: "I am the devil." His voice became commanding and he had a cruel sneer on his lips, all this exceedingly different from his usual calm and passive demeanor. I ignored this new behavior, and by the time we reached our destination it disappeared.

After some months, the resident finished his time with us and went elsewhere. All the MPD cases he had diagnosed, and who had acted accordingly, gradually disappeared and we were left with standardly disturbed individuals. His presence created an interesting blip in the ordinary work-a-day world of inpatient psychiatry.

Two possibilities exist. Either he was exceedingly adept at diagnosing the "real" problems, or he inadvertently trained the patients into behavior that fit his preconceptions. In the years that followed, I remember there may have been two cases that were suspected of MPD, but those were never confirmed. In my estimation, we had an excellent example of how the practitioner can "find" what he/she looks for.

Bertram Rothschild
Aurora, Colo.

The excellent article on multiple personality disorder by August Piper Jr. reminded me that this is another pseudoscientific idea taken from science fiction. In 1951 *Galaxy* magazine published "Beyond Bedlam" by Wyman Guin. This described a society that has abolished violence, at the price of having everybody suffer from MPD (here wrongly called 'schizophrenia').

In this story every 'body' has two personalities, which are allowed equal time. Other emerging personalities are ruthlessly suppressed by 'Medicorp' (a police force) and the use of drugs. Although this society is set in the far future, significant dates in its evolution include 1986, 1996, and 1997.

Jim Ring
Tahunanui, Nelson
New Zealand

The Sleep Paralysis Experience

I'm writing in response to the article by Susan Blackmore regarding sleep paralysis and "alien abductions" (May/June 1998). I'm a 36-year-old male with a law degree and have felt for many years that sleep paralysis was the basis not only for so-called alien abduction but also for ancient reports of incubi and succubi.

As a child and later as a young adult, I experienced sleep paralysis on numerous occasions. I had the same experiences detailed by Blackmore in her article (waking up just as I was drifting off to sleep and being paralyzed, feeling that someone was in my house or apartment, being unable to move, etc . . .). Many times when I was finally able to waken fully I would be so afraid that someone had broken into the house that I would check all the doors and windows to make sure everything was locked up (and of course they were).

Sometimes I felt that I had possibly seen a ghost, but as I grew up and learned more about science and the mind I came to realize what was happening even though I didn't have a name for it. When I first heard the reports of sleep paralysis (in *Omni* magazine, I believe, sometime in the early 1980s) I knew immediately that that was what I had experienced.

Having had this experience I can testify to the fact that the "waking dream" the person experiences can seem very real. The fear lingers for hours, sometimes days, after the experience and can even make one paranoid to the point of having to go to great lengths to ensure that their house is secured against intruders.

Once I realized what was happening the experiences seemed to stop (I can't remember having one in over ten years), and the last time it happened I remember not feeling the fear since I knew what was going on and allowed myself to relax and go back to sleep.

Alan Foxman
foxmana@gtlaw.com

Correction on Name

As pleased as I was that you chose to publish my letter (July/August) re Martin Gardner's deviation (in my opinion) from the skeptical path, I was equally surprised (considering that you had my letter in printed form) to find my name changed to "Raslom."

Could you please run a correction in your next issue.

Jef Raskin
Pacifica, Calif.

The letters column is a forum for views on the matters raised in previous issues. Letters should be no more than 225 words. Due to the volume of letters, not all can be published. They should be double-spaced. Address: Letters to the Editor, SKEPTICAL INQUIRER, 944 Deer Dr. NE, Albuquerque, NM 87122.

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